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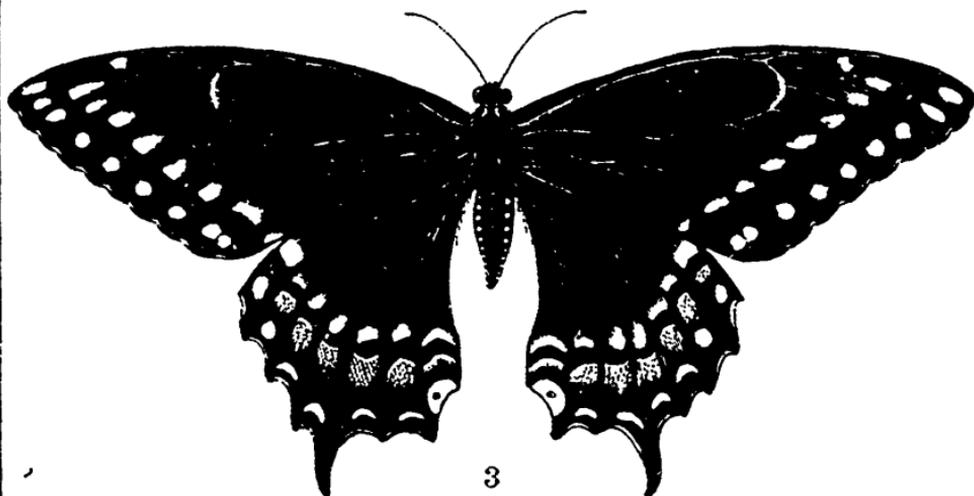
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• 1. *Papilio Turnus*. 2. *Papilio Asterias*, male. 3. ———, female.

THE
CANADIAN
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VOLUME II.

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ARTICLE XX.—*Notes on Insects now injuring the Crops in the vicinity of Montreal*, by WILLIAM STEWART M. D'URBAN, Sub-curator, Montreal Natural History Society.

My object in communicating the present paper, is to call the attention of this Society to the ravages which certain insects are at this moment committing amongst the crops in our vicinity, and to give such information about them as I have been able to collect. I trust some one with more leisure than myself will be induced to turn his attention to this interesting subject, and endeavour to complete the history of the different species of which at present we are quite ignorant.

Being anxious to investigate the insects injurious to Agriculture in this country, I begged James Logan, Esq., to inform me when any species were observed infesting the crops on his property near Montreal. Accordingly about the middle of this month he kindly told me that "Cutworms" and other insects had been committing great havoc amongst his oats and Indian corn, &c.,

this spring, and on the 15th inst., I walked out with him to his farm; we first examined a patch of *Indian corn*, or maize, about $1\frac{1}{2}$ arpents in extent; it was planted from 23rd to 28th May. The soil of the field is a sandy loam, and was ploughed from grass last autumn; the plants were two or three inches high, but so many had been killed, it had been sown over a second time on the 8th June, and this last sowing had hardly sprouted at all. As soon as we reached the field we perceived many plants looking dead and withered, and set deeper in the soil than the healthy ones; on laying hold of these they instantly came up in our hands, and we found them cut through about half an inch below the surface of the ground; many had been severed at the junction of the stalk and the grain, and thus entirely destroyed; some had their tops cut off above ground, and the leaves eaten: these will probably shoot again; many stalks were only partially cut through, but as the "worms" appear to eat out the heart of the plants, they are as effectually destroyed as if eaten entirely through. In most instances every plant in a clump or "hill" had been killed, though sometimes one or two of the strongest had been left untouched; in a portion, about twelve paces long, of one row, every plant on every hill was destroyed. On removing the earth from around the withered plants, we discovered a red-headed greyish larva coiled up just below the surface of the ground; we found one or two in almost every hill which we examined, and which showed any signs of their presence; but in a few cases we did not see any, probably having accidentally covered them up with the soil, or perhaps they had shifted their quarters during the night; I did not find more than two or three in the same clump. In about an hour we dug up between 60 and 70 larvæ from two or three rows of corn, they varied in size from 5 lines long and 1 line thick to 17 lines long and 3 lines broad, but were generally about 8 lines long. The pumpkins sown amongst the Indian corn had not been touched by them. Besides the "Cutworms" I found two or three "Wireworms," the larvæ of a coleopterous insect of the genus *Elater*, which were eating the seeds and stalks of the young corn under ground. We next inspected a patch of oats, 8 arpents in extent, in the same field, separated, however, from the Indian corn by a deep but grassy ditch; it had also just been re-sown; at a distance, large irregular patches of the field appeared quite bare, and on looking at them closer we perceived that in these spots almost every plant had been killed, and we found at

their roots a good many of the same larvæ as those destroying the maize; they were not however so numerous as in the latter. They were first noticed among the oats about the 25th May, when the Indian corn was not up, I am therefore inclined to think they deserted the oats for the corn as soon as it came up; the infected plants presented the same appearance as those of the corn, except that they were whiter and more sickly looking, most having quite dried up. At the side of the field where a dung heap had stood, the oats were very luxuriant, and at a little distance did not appear attacked by the "worm," but on closer examination we found many at work at these also, and of rather a larger size than elsewhere; I found one or two dipterous larvæ at the roots of the oats but whether eating them or not I could not determine. I noticed *Calosoma calidum* running across the field, and I have no doubt this fine beetle, both in its perfect and larval states, is extremely beneficial in destroying the Cutworms, and also the larvæ of that pest, the common Apple Moth, (*Clisiocampa Americana*). It may sometimes be seen running up trees in search of the latter. A specimen I enclosed in a small box with some Cutworms soon demolished them. It is much to be regretted that a prejudice exists against this useful insect, and that many persons make it a practice to crush all they see; and as this species is constantly running about in the daytime, great numbers must be destroyed in this manner; I frequently see them lying crushed on the pathways round Montreal, and I never pass one of these unfortunate victims to popular delusion without feeling a pang of regret that it should have met with such an unscientific fate. But by far the greatest enemy of the "Cutworm" is a long black larva, somewhat flat and linear in shape, and most probably also Carabidous, which I found rather numerous amongst the oats, concealing itself under the lumps of earth, and rapidly burying itself if disturbed; the largest was about one inch and 3 lines long, but most were only 7 lines in length; I found one which had just been engaged in sucking out the juices of an unlucky Cutworm, of which it had left nothing but the shriveled skin; a single specimen confined with several Cutworms and a larva of *Clisiocampa*, destroyed them all in the night, and became enormously distended, having swollen to about twice its natural size, which however it regained by the next day. I find by experience that one of these larvæ takes about an hour and a half to finish a single Cutworm, passing it gradually between its jaws till all its

juices are squeezed out. If one be kept without food for some time, and a Cutworm be dropped into the box, it is amusing to witness the fury with which it is seized as soon as perceived; the moment the worm is laid off, it throws itself about with such violent contortions that its antagonist is thrown from side to side, but this avails it not, for it cannot loosen the hold of those merciless jaws; if however the Carabidous larva should happen to seize its prey by one of its anal segments, the worm turns round and inflicts such a bite as instantly compels it to retreat, but the hard plates with which the anterior part of its body is clothed, and which are doubtless intended as a defence against this very danger, protect it from being much injured, and it soon returns to the charge, and takes good care to fasten itself the second time close behind the head of the Cutworm, which effectually puts an end to the latter's powers of resistance. I left two together in a box over night, and when I next looked at them one had appeased its hunger on the body of its companion, leaving nothing but its dry skin. The Cutworms, if confined together without much food, have the same cannibal propensity, soon destroying each other; nor is it always the strongest which devours the weakest, for I found two small specimens had destroyed a large one with which I put them. When one seizes another, it never lets go its hold till it has sucked out all the nutriment its victim contains.

The following is a description which I have drawn up of the *Cutworm of the Indian corn and oats*.—No. 1. Smooth and semitransparent; head, red; corneous shield on the first segment next the head, dark brown; all the rest of the segments greyish white, (almost pure white immediately after changing its skin, and dark grey when full of food) with numerous small polished spots of a darker shade than the ground colour, and arranged by pairs down the back and sides; it has also a few very fine scattered hairs, mostly proceeding from the small spots.

Dr. Asa Fitch, in his admirable reports on the noxious insects, of the State of New York, page 312, describes five species of Cutworm, and the present appears to agree with the description of that termed by him the "Red-headed Cutworm;" I found one of the same species at the roots of grass in one of Mr. Logan's fields, and it may be commonly found under stones, in the early spring, as soon as the snow clears off the ground, but it is then only of small size.

When Mr. Logan and myself had concluded our examination of his oats, we proceeded into the adjoining field, containing mangold wurzel, and only separated from the last by a wooden fence: it was sown on 30th April and 1st May; I observed that the hearts of many of the young plants had been eaten out and the leaves consumed, and some were cut below the surface of the soil. Having little time to spare, I only found one large lepidopterous larva, of a different species from that amongst the oats; and more resembling the larva of a *Graphiphora* than that of an *Agrotis*. The following is a description of it:—

Cutworm of the Mangold Wurzel, No. 2.—Length, 16 lines; smooth, dark brownish-grey, but not transparent; head and corneous shield of 1st segment, black striped with white; faintly lined down the back and sides, and covered with numerous polished dots similar to those in number 1, but darker and differently arranged; 3 black dots on each segment over each spiracle, which is also black. This larva has since died; it does not answer to any of those described by Dr. Fitch.

Oats were grown in this field last year, and they then suffered much from the “Red-headed Cutworm,” it was ploughed from grass the previous year, mostly in Autumn, but a part now under beans not till the spring before last; and the oats which grew on it were much more injured by the Cutworms than the rest, probably from the larva in the grass having been undisturbed all the winter. I noticed that the little brown *Turnip Beetle* (*Haltica*) was already very numerous, and had eaten small round holes in the leaves of the young mangold wurzel. The horse beans in this field were looking remarkably well, and I understand they have not been injured by anything; they were sown on 23rd and 24th April. On the 24th inst., I again walked out to the farm, the second sowing of Indian corn had been up a day or two, and the persevering Cutworms had commenced on this also; I found a good many, and some were still small, being only about 7 lines long, but they were by no means as numerous as the first day, probably owing to their having been disturbed by farming operations; for Mr. Logan, despairing of his crop of maize, had sown Turnips with a sowing machine along the rows of corn; and had also applied a dressing of guano to the surface during rain. The *Halticas* had already found them out, although only a quarter of an inch above ground, and were busily engaged planning their

destruction ; I found one specimen of a small green lepidopterous larva at the roots of a plant of corn.

Lepidopterous Larva of the Indian Corn, No. 3.—Length 7 lines, pale green with longitudinal stripes of white and a darker shade of green. I am not aware to what genus this belongs. The Clipping Sparrow (*Embriza socialis*) was numerous in the field, amongst the corn and oats, and I saw one with what I thought a Cutworm in its bill. I have little doubt these birds, as well as crows, &c., are very useful in thinning the numbers of this destructive insect. The oats had grown a good deal, some guano and salt had been thrown over the second sowing of them ; the worms were not numerous, but I found several large sized specimens at the roots of the rank plants growing where the dung heap had been.

The Mangold Wurzel had been thinned out, I am told some larvæ were found in it, but as I did not see them, I do not know of what species they were.

Having now given in detail the hasty observations which I was able to make in two short visits to the infested fields, I will add some illustrations of the Natural History of the family of Moths which produce the Cutworms ; want of time prevents my again noticing the Coleopterous and Dipterous larva previously mentioned.

The “Cutworms,” as they are termed in America from their peculiar mode of destroying plants by gnawing through them with their powerful jaws, and some of which I now exhibit, are the larvæ of Lepidopterous insects of the family Noctuidæ, and principally of the genus *Agrotis*, a widely distributed group of Moths. All the numerous species of this genus are, in the larva state, nocturnal and underground feeders, eating the roots and leaves of various low plants, and are all more or less destructive to the Graminacæ, being great enemies to the farmer from their partiality to the various cereals. All the species in their perfect form fly by night, concealing themselves during the day in dark places, such as crevices of walls, behind bark of trees, in long grass, &c., but some may be found asleep in the day time, on the flowers of the golden rod, and similar plants, in the autumn. Exclusive of doubtful natives, not less than 23 species inhabit Great Britain. In America the number of species is also large ; some of the species are cosmopolitan, and several found in this country also occur in England, and other parts of Europe. The eggs, larvæ

or pupæ, of many have no doubt been carried across the seas by ships, in the soil round the roots of plants, &c., exported from one part of the world to another; and have thus been introduced into countries of which they were not originally natives, and some species finding suitable food and climate, have become naturalized, whilst others not so favourably situated, occur but rarely in the countries to which they have been transported. As an example of the first of these two cases I will instance *Agrotis suffusa*, which is of wide world distribution, and is tolerably numerous about Montreal, coming to sugared trees on the Mountain, at the end of September and beginning of October; it is a common species in England, appearing there also in September and October, it frequents Ivy-blossoms, &c., and hibernating comes forth a second time in the early spring, and may then be taken at sallow-blossoms and sugared trees; the larva feeds on the roots of grasses, but is not so destructive as some of the other species.

Agrotis subgothica is a good illustration of the second case, it is a very abundant species round Montreal, appearing in July and continuing till late in the autumn. It frequently flies in at the open windows during the summer evenings, attracted by the lights in the rooms. It is very likely produced from these Red-headed Cutworms, but I do not know for certain, as I have never had time or opportunity to trace it through its various transformations. It has occurred a few times in England, but so rarely that it is marked as a doubtful native in the British Museum Catalogue of British Lepidoptera, and is not now admitted into the British Lists. *Agrotis segetum*, a common English species, is sometimes very destructive in that country to young wheat, of which it devours the roots in autumn and spring. Mr. H. Doubleday says it is very troublesome in gardens, often destroying Anemonies, and eating into the roots of Dahlias, &c. It is the larva of this or of one of the closely allied species which often injures the turnip crops, in the autumn to a very great extent, in different parts of England.—See Humphrey and Westwood's British Moths, p. 116. It is not only the genus *Agrotis*, however, which is so destructive to the farmers crops, for several allied genera with similar habits, such as *Chareas*, *Cerapteryx*, and *Graphiphora*, are capable of inflicting severe injury. What devastation *Cerapteryx graminis*, a European species, can cause in grass lands, the following extracts from the work I have just mentioned will show:—"This Moth appears in July and August, occasionally in great numbers in certain

districts, indeed it is recorded that in Sweden, towards the middle of the last century, the ravages of the larvæ were so extensive that whole meadows appeared white and dry, as though a fire had passed over them. In some parts of England spots of a mile square have been observed totally covered by them, and the grass devoured to the root; and Mr. Wailes has recorded in the Entomological Magazine, that in one year at least fifty acres of grass upon Skiddaw, were so completely devastated, and the line of devastation so clearly marked, that even from the town of Keswick the progress of the larvæ down the Mountain could be distinctly noticed. Vast quantities of Rooks flocked to the spot to feed upon the delicious repast afforded by these caterpillars, but so greatly was the vegetation destroyed, that even several years afterwards the extent of their ravages was distinctly visible. 'Of course,' adds Mr. Wailes, 'the quality of the newly grown herbage was materially improved,' thus affording another instance of indirect advantages derived from insects;" Humphrey and Westwood, p. 113. Their ravages were noticed by Linneus, who says they will not eat *Alopecurus pratensis*, *Trifolium pratensis*. This is a good hint to our farmers to enquire whether any species or varieties of grass, wheat, &c., are obnoxious to the American Cutworms, and if any are discovered, by growing them exclusively for a few years, in such places as are most infested by the worms, they would probably in a great measure disappear. Dr. Fitch says that "he does not think the fertility of the soil or the kind of manure which is applied to it, has any influence upon them, excepting in making plants more succulent; for it is vegetation of this character which appears to be their favorite food. We all know these worms are common in our highly manured gardens and I have never found them more plentiful than on one occasion among beans planted upon a hill side so barren that it was thought nothing else could be raised there." In another place he also gives some interesting particulars, extracted from the Albany Cultivator, relative to a Hymenopterous insect, (probably a SpheX) which collects the larvæ to store her nest with them, as food for her offspring.

The history of these insects appears to be as follows:—The Moths come forth toward the end of the summer, and the females deposit their eggs in the ground; these hatch in a short time, and the young larvæ commence feeding on roots of grass, &c., until the frosts of autumn set in, when they bury themselves in

the ground, or seek shelter under stones, whence they emerge as soon as the spring is sufficiently advanced, and attack the crops almost immediately they are above ground. When the larva is full fed it changes to a brown pupæ at a small depth in the soil, without spinning any cocoon, but forming a smooth cavity in the ground; in a few weeks this produces the perfect insect, similar to those species of which I now exhibit specimens.

It is certainly not very encouraging to the farmer to reflect how many plants they will attack, and here is a formidable list of those to which one or other of the species have been found more or less destructive:—

Cucumbers.—30 sometimes found round one vine.

Cabbages.—Whole fields cut down in a night.

Beans.—Frequently much injured.

Oats.—Fields completely devastated.

Wheat.—Often very much injured,

Indian Corn.—The whole crop sometimes disappears.

Onions.—Occasionally eaten.

Buckwheat.— Do.

Mangold Wurzel.—Much infested.

Turnips.—Occasionally by English species.

Grasses of various kinds.—Meadows sometimes stripped of all vegetation.

Cotton.—In the south, larvæ of the same habits and appearance are very destructive to the young plants.

The only reliable method of destroying the larvæ is to dig them up one by one from the roots of the plants, and this can be done easily enough in the rows of Indian Corn, which is the crop they appear to injure most, at least in this neighbourhood. The labour would be well bestowed, as every larvæ destroyed may be considered as equivalent to at least half-a-dozen plants of corn saved. It is said that by making deep holes in the fields, they will fall in during their nightly wanderings, and being unable to get up the perpendicular sides of the pits, owing to the crumbling earth breaking away under their weight, they are thus easily captured and may be killed at leisure. It is probable that a deep trench kept free from weeds, and in good repair, dug all round the fields, would preserve the crops from attack, but care must be taken before night to remove anything, such as a bridge, boards, &c., by which they might cross.

I will now bring my observations to a conclusion ; I fear I have trespassed too largely on the patience of the meeting, but trust it will consider the importance of the subject as some excuse for my prolixity, and the numerous extracts which I have made from the various works I have consulted.

NOTE.—I am indebted to James Logan, Esq., for the dates of sowing of his various crops.

ARTICLE XXI.—GLEANINGS in the *Natural History of the Hudson's Bay Territories, by the Arctic Voyagers.**

The two books of which we give abstracts of the titles below, are the most interesting of all those that have been brought forth as the fruits of that great scientific undertaking, the discovery of the North West Passage. The first contains a narrative of Sir John Richardson's journey by land to the Arctic Sea, in 1848, and his return by the same route in 1849. Sir John left Liverpool on the 25th March, 1848, landed at New York on the 10th April, and arrived at Montreal five days after. At Lachine he was supplied by Sir George Simpson with experienced voyageurs who were engaged as canoe-men for the long journey. On the 29th April he reached Sault St. Marie, at the outlet of Lake Superior, on the 12th May, Fort William, on the 18th the summit of the water shed which separates Lake Superior from Lake Winipeg, on the 5th of June, Cumberland House, one of the Company's Stations, situated on the Saskatchewan, and on the 15th of September, Fort Confidence. This station is about three miles from Dease River on Great Bear Lake, in latitude $66^{\circ}, 54'$, north, and longitude $118^{\circ}, 49'$, west.

It is within 100 miles of the shores of the Arctic Sea, and 2530 miles, from Montreal by the route travelled. Here the party remained during the winter of 1848-49, and returned to England in the following summer.

* 1. *Journal of a Boat voyage through Rupert's Land and the Arctic Sea, in search of the Discovery Ships under the command of Sir John Franklin, with an Appendix on the Physical Geography of North America.* BY SIR JOHN RICHARDSON, LONDON, LONGMAN, BROWN, GREEN AND LONGMANS, 1851.

2. *McCLURE'S Discovery of the North West Passage, Edited by CAPT. OSBORNE, LONGMAN, BROWN, GREEN, AND LONGMANS, LONDON, 1857.*

Capt. McClure's expedition, it is scarcely necessary to state, was by sea, by Cape Horn through the Pacific Ocean and thence into the Arctic Ocean from the west. He left Plymouth in the "Investigator" on the 20th January, 1850, and was frozen in during the autumn of 1851, on the north coast of Bank's Land, a large island in the Arctic Sea, about half the distance between the two extremes of the passage sought to be explored. Here they remained until April, 1853, when they were discovered by the crew of the "Resolute" under Capt. Kellett, who had entered the passage from the Atlantic side in search of Sir John Franklin.

By Captain McClure and his brave party the most famous problem in the physical geography of the globe has been solved, and though the results can never be made of any great commercial importance, yet, as all new truths contribute to the intellectual advancement and happiness of our race, the labour has not been lost. To such of our readers as feel inclined to explore the frozen regions of the north by their own comfortable firesides, we cheerfully recommend the works from which the following extracts are taken. They are illustrated by some exceedingly good plates of the Indian tribes and of Arctic scenery, and are full of new and entertaining facts. The natural history observations are particularly interesting, and it is from these that we shall make a few selections.

1. *The peregrine falcon.*—Sir John Richardson, while descending the Mackenzie River, noticed the nest of a peregrine falcon on a cliff of sandstone rock. This bird is not rare throughout that region where it preys on the passenger pigeons and smaller birds. "Mr. McPherson, says Sir John, related to me one of its feats, which he witnessed some years previously as he was ascending the river. A white owl (*Syræ nyctea*,) in flying over a cliff, seized and carried off an unfledged peregrine in its claws, and, crossing to the opposite beach, lighted to devour it. The parent bird followed, screaming loudly, and stooping with extreme rapidity, killed the owl by a single blow, after which it flew quickly back to its nest. On coming to the spot, Mr. McPherson picked up the owl, but though he examined it narrowly he could not detect in what part the death blow had been received; nor could he from the distance perceive whether the peregrine struck it with wing or claws."—*Richardson, Vol. 1, page 206.*

2. *A Hare Indian devoured by a Bear.*—By Mr. Bell, I was informed of the melancholy death of an Indian in the vicinity of

Fort Good Hope. This poor man, having set several snares for bears, went to visit them alone. The event showed that he had found a large bear, caught by the head and leg, and endeavoured to kill it with arrows, several of which he shot into the neck of the animal. He seems to have been afraid to approach near enough to give full effect to his weapons, and the enraged bear, having broken the snare, flew upon him and tore him in pieces. The man's son, a youth of about sixteen years of age, becoming alarmed by the lengthened absence of his father, took his gun, and went in quest of him, following his track. On approaching the scene of the tragedy, the bear hastened to attack him also, but was shot by the lad as he was rushing at him. The boy found his father torn limb from limb, and mostly eaten, except the head, which remained entire. The bear, whose carcass was seen by Mr. Bell, was a brown one, and of great size. Fragments of the snare remained about his neck and leg.

These brown bears are very powerful; and the same gentleman who told the above story informed me that on the Porcupine River, to the west of the Peel, he saw the foot-marks of a large one which having seized a moose deer in the river, had dragged it about a quarter of a mile along the sandy banks, and afterwards devoured it all, but part of the hind quarters. The bones were crushed and broken by the animal's teeth, and, from their size and hardness, Mr. Bell judged the moose to have been upwards of a year old, when it would weigh as much as an ox of the same age. The species of these northern brown bears is as yet undetermined. They greatly resemble the *Ursus arctos* of the old continent, if they are not actually the same; and are stronger and more carnivorous than the black bears (*Ursus americanus*), which also frequent the Mackenzie. The grisly bears (*Ursus ferox*) reach the same latitudes, but do not generally descend from the mountains.—Richardson, Vol. 1, page 217.

3. *The Musk Ox, Ovibos moschatus*.—The evening proving fine, Mr. Rae and Albert went out to hunt, and both had the pleasure of seeing the musk-ox, for the first time in their lives. The *uning-mak* is known by name and reputation to all the Eskimo tribes; but as it does not exist in Greenland, or Labrador, nor in the chain of islands extending north from that peninsula along the west side of Davis Straits, Albert, who was a native of East Main, now for the first time approached its haunts. Mr. Rae, with the feelings of an ardent sportsman, had longed to en-

counter so redoubtable an animal; and the following is an account of the meeting:—

On perceiving a herd of cows, under the presidency of an old bull, grazing quietly at the distance of a few miles from our bivouack, he and Albert crept towards them from to leeward; but the plain containing neither rock nor tree behind which they could shelter themselves, they were perceived by the bull before they could get within gun-shot. The shaggy patriarch advanced before the cows, which threw themselves into a circular group, and, lowering his shot-proof forehead so as to cover his body, came slowly forwards, stamping and pawing the ground with his fore-feet, bellowing, and showing an evident disposition for fight, while he tainted the atmosphere with the strong musky odour of his body. Neither of the sportsmen were inclined to irritate their bold and formidable opponent by firing, as long as he offered no vital part to their aim; but, having screwed the bayonets to their fowling-pieces, they advanced warily, relying on each other for support. The cows, in the meantime, beat a retreat, and the bull soon afterwards turned; on which Mr. Rae fired, and hit him in the hind quarters. He instantly faced about, roared, struck the ground forcibly with his fore-feet, and seemed to be hesitating whether to charge or not. Our sportsmen drew themselves up for the expected shock, and were by no means sorry when he again wheeled round, and was, in a few seconds, seen climbing a steep and snow clad mountain side, in the rear of his musky kine.

These animals inhabit the hilly, barren grounds, between the Welcome and the Copper Mountains, from the sixty-third or sixty fourth parallels to the Arctic Sea, and northwards to Parry's Islands, or as far as European research has yet extended. They travel from place to place in search of pasture, but do not penetrate deep into the wooded districts, and are able to procure food in winter on the steep sides of hills which are laid bare by the winds, and up which they climb with an agility which their massive aspect would lead one ignorant of their habits to suppose them to be totally incapable of. In size they are nearly equal to the smallest Highland or Orkney *kylous*; but they are more compactly made, and the shaggy hair of their flanks almost touches the ground. In structure they differ from the domestic ox, in the shortness and strength of the bones of the neck, and length of the dorsal processes which support the ponderous head. The swelling bases of the horns spread over the foreheads of both sexes, but are

most largely developed in the old males. The musk-ox has also, the peculiarity in the bovine tribe of the want of a tail; the caudal vertebrae, only six in number, being very flat, and nearly as short, in reference to the pelvis, as in the human species; the extreme one ending evenly with the tuberosities of the ischium. A tail is not needed by this animal, as in its elevated summer haunts moschetoës and other winged pests are comparatively few, while its close, woolly, and shaggy hair furnishes its body with sufficient protection from their assaults. The fore-pasterns are provided on their outsides with a slender accessory bone, of about half their length. The fossil Irish elk and musk-deer have also rudimentary toes, but of a different form. Though I have not been able to ascertain that the range of the species was ever greater than it is known to be at present, I have read somewhere of a skull having been found in Greenland. One in tolerable preservation, but defective in the nose, was procured by Captain Beachy, from that very curious deposit of bones in the frozen cliffs of Eschscholtz Bay of Behring's Straits. That skull is now preserved in the British Museum, and a perfect skeleton of the recent animal exists in the museum at Haslar Hospital.—*Richardson Vol. 1, page 322.*

The general habits of the musk-oxen of the Archipelago resemble strongly those of the reindeer; but they appear to be principally confined to Melville Island, Bank's land and a large island to the south-east of the latter.

None of them were seen alive on Bathurst or Cornwallis Land, although ancient skulls and bones have been found on both shores of Wellington and the Queen's Channel, yet not in very great numbers. One musk-ox was found, in 1851, in Byan Martin Island; it appeared to have died from old age or starvation. Captain McClure only obtained three oxen from Mores Bay, but subsequent visitors to Bank's Land, Captain Meham and Mr. Krabbé, have seen numbers. Yet, so far as places visited can be taken as an authority upon the subject of their locality, it appears as if the south-west extreme of Melville Island was their favourite haunt, especially that portion of it lying between Liddon Gulf and Cape Russell; and it is worthy of remark, that that portion of Melville Island, although possessing a southern aspect, impinges upon the vast area of never-thawing ice, that "land of the white bear," from whence the west wind appeared to bring such intense cold whilst the "Investigator" was imprisoned against Ballast Beach in Bank's Land.

Commander G. F. Meeham, whose interesting remarks, whilst searching in the above direction, are of great value in many respects, makes the following general observations upon the animals he fell in with in 1853:—

“Game was only procured when required for use, otherwise great quantities might have been obtained on Melville Island. About the sloping land from Cape Smyth up to the head of Liddon’s Gulf, animals were seen in great numbers, but particularly about the 115° of longitude, were both in April and June musk-oxen were very numerous. I saw, in a walk overland of ten miles, as many as 150 head of cattle. At Cape Smyth, on June 18th, a perfectly white musk-cow was seen with a black calf grazing with another cow and calf of the usual colour. Only one small herd of reindeer was seen while crossing Melville Island to Winter Harbour in July, as the land was then covered with water, or else in a deep swamp. In June and July, innumerable lemmings were seen both on the land and ice. Those on the latter were frequently carried off by the burgomasters, which were always in great numbers wherever the land was high or steep. At the entrance of Liddon’s Gulf two large flocks of snowy geese were seen, but, in general with all the waterfowl, were very wild.

“From the barren state of the soil of Eglintoun and Prince Patrick’s Land, I am inclined to think that it is not a very favourite resort for animals. Several traces were seen in May and June on the ice, all travelling *from* Melville Island to the westward. On Patrick’s Land we found vegetation only immediately on the south beach, and that only as far as 122° W. Throughout the journey beyond that, until returning again to the southern shore on June 1st, no traces or animals were seen of any kind except two bears off Cape Manning.

“The musk-oxen were all very wild in April, and generally seen in large herds from ten to seventy in number. In June they were stupidly tame, and seemed to be worried with their heavy coats of wool, which were hanging loosely down their shoulders and rumps in large quantities; the herds much smaller, and generally composed of cows and calves.

“At Cape Russell I walked up to within ten yards of two cows and a bull without their taking the least notice of me, and when I fired, only ran about five yards and commenced grazing. The cows were at first butting at the bull, who received their blows with the crown of his horns, which sounded like the meeting of two heavy skittle-balls.”

The heavy coat of wool with which the musk-oxen are provided is a perfect protection against any temperature. It consists of a long fine black hair, and in some cases white (for it is not ascertained that these oxen change their colour during the winter); with a beautiful fine wool or fur underneath, softer and richer than the finest alpaca wool as well as much longer in the staple. This mantle appears to touch the ground, and the little creatures look like a bale of black wool, mounted on four short nervous goat-like legs, with two very bright eyes, and a pair of sharp wicked-shaped horns peering out of one end of it. Captain McClintock, of H. M. S. "Intrepid," gives the following dimensions of some oxen shot by him in 1851, which are a very fair average, the animals seldom exceeding the size of Shetland ponies.

Measurements of Musk-Oxen. Shot at Melville Island in 1851.	Bull.	Bull.	Cow.	Cow	
	ft. in.	ft. in.	ft. in.	ft. in.	
From base of horns to root of tail.	7 2	5 10½	5 2	5 4	The roots of the horns meet over the forehead, and in the bulls spread out longitudinally, forming a secure shield for the head. In the cows the roots of bases of the horns are much smaller, and are buried in long hair.
Width of the base of horns measured longitudinally.....	—	0 11½	—	—	
Base of horns (including their width) to the nose.....	1 10½	—	1 4½	—	
Hoof to tip of shoulder.....	4 9	4 7	4 1½	—	
Hind hoof to top of rump.....	4 3	—	—	—	
Corner of mouth to eye.....	0 10	0 10	0 9	—	
Round of muzzle above the nostrils.	1 9	1 9	1 7	—	
From one eye to the other.....	0 11¾	—	0 9	—	
Round of fore leg, just above the hoof (fetlock?).....	0 7	0 7½	—	—	
Width of fore hoof.....	0 4½	0 4½	0 3¾	—	
Its circumference.....	1 4	1 3¾	1 1	—	
Width of hind hoof.....	0 3¾	—	0 3¾	—	
From tip to tip of horns.....	2 8	2 3¼	1 3½	—	
Length of each horn.....	2 3	2 0	1 7	—	
Length of tail.....	0 2	—	0 1¾	—	

They seem to be of very uncertain temper, sometimes standing stupidly glaring at their assailants, wheating their horns against their fore-legs; and at other times our sportsmen had to be quick in escaping from their fury.

Of their activity when excited, Captain Meham speaks in another part of his diary, before quoted.

"During our stay, I proceeded to the northward, overland towards the head of Hardy Bay, Melville Island. The land rises to an elevation of about 800 feet above the sea, and nearly all the hills are of a remarkable table shape. Musk-oxen are here in very

great numbers; on one plain I observed as many as seventy grazing within a circuit of two miles; on my approach they divided into herds of about fifteen each, headed by two or three enormous bulls. Their manœuvres were so quick and regular that they were more to be compared to squadrons of cavalry than anything I could think of. One herd advanced several times at a gallop within rifle-shot, and formed in perfect line with bulls in advance, showing a formidable front of horns. The last time they advanced at a gallop to about sixty yards, and formed in line, the bulls at the same time snorting and tearing up the snow. Immediately I fired they wheeled round, joined the main herd, and made off out of sight, only waiting occasionally for the wounded one."

And in Captain L. McClintock's sledge journey along the northern coast of Melville Island and Prince Patrick's Island, he gives a glowing description of an encounter with a noble bull, which we transcribe as it stands in the Blue Book of 1855:—

"We saw and shot two very large musk-bulls, a well-timed supply, as the last of the venison was used this morning; we found them to be in better condition than any we had ever seen. I shall never forget the death-struggle of one of these noble bulls; a Spanish bull-fight gives no idea of it, and even the slaughter of the bear is tame in comparison. This animal was shot through the lungs, and blood gushed from his nostrils upon the snow. As it stood fiercely watching us, prepared, yet unable to charge, its small but fixed glaring eyes were almost concealed by masses of shaggy hair, and its whole frame was fearfully convulsed with agony; the tremulous motion was communicated to its enormous covering of tangled wool and hair; even the coarse thick mane seemed to rise indignant, and slowly waved from side to side. It seemed as if the very fury of its passion was pent up within it for one final—a revengeful—charge. There was no roaring, the majestic beast was dumb; but the wild gleam of savage fire which shot from his eyes, and his menacing attitude, was far more terrible than the most hideous bellow. We watched in silence, for time was doing our work, nor did we venture to lower our guns until, his strength becoming exhausted, he reeled and fell.

"I have never witnessed such an intensity of rage, nor imagined for one moment that such an apparently stupid brute, under any circumstances of pain and passion, could have presented such a truly appalling spectacle. It is almost impossible to conceive a more terrific sight than that which was presented to us in the dying

moments of this matchless denizen of these northern wilds. A mile or two farther we saw four milch cow and a very small calf.”

It appears to be doubtful whether the wolf, naturally a most cowardly creature, is able to act in any way offensively against the musk oxen;—the general impression amongst the naval officers employed in localities where a good opinion upon the subject could be formed, was, that the wolf would only attack the lame or sickly cattle.

The activity of these oxen, and goat-like power of climbing, is very remarkable, and much at variance with their clumsy appearance. They have been seen making their way, when frightened, up the face of a cliff which defied all human efforts to follow them, and going down the precipitous sides of ravines by alternately sliding upon their hams or pitching and arresting their downward course by the use of the magnificent shield of horn which spreads across their foreheads, in a manner to call forth the astonishment of the beholder.

4. *Non-migration of the Arctic fauna.*—It will not here be out of place to throw together the observations generally collected upon the habits of those two important animals for the Arctic navigator, the reindeer and musk-ox. The facts are spread over a great amount of journalising, but the writer, anxious to place on record the new information gleaned, has here given it, premising that he is no naturalist, and that he alone is responsible for the non migration theory, having been nearly excommunicated as a heretic in 1851, for first giving utterance to it at Griffith’s Island. Now that the trustworthy records of the voyages of Captains M’Clure, Austin, Kellet, Penny, and Kane, have put us in possession of many facts connected with the movements of the oceanic ice up to a very late period in the year, in different parts of the arctic archipelago, we are able to see that the statement of an autumnal migration of the herbivorous animals, to the Continent of America, for the purpose of avoiding the rigours of an arctic winter, is no longer tenable.

The great winter drift, in 1849 and 1850, of Sir James Ross and Commander De Haven from Barrow’s Strait and the top of Wellington Channel, proved that the ice around those lands was in motion long after winter had set in, and that at the season of utter darkness, those wild seas were churning and rolling on in their mysterious course to south latitudes. We have seen since then, that the ice beset the “Investigator” in Prince of Wales

Strait, and Capt. Kellett's squadron in Melville Sound were not stationary until the close of November; and long after that period during spring-tides or in strong gales, there was abundant evidence that large spaces of water and weak ice existed around them; such, in short, as would be quite sufficient to prevent timorous deer or musk-oxen attempting a journey which would have puzzled even an amphibious animal. Additional testimony abounds elsewhere; the ice of Queen's channel and around the winter quarters of H. M. S. "Pioneer," in Northumberland Sound (1852-53), was even so weak, or else so heavily packed, at the end of the winter, that it could with difficulty be traversed by our men; and near Dr Kane's winter quarters, in Smith's Sound, the ice was either so treacherous or so piled up, that his parties could not cross it from Greenland to the western coast.

All this betokened insuperable difficulties in the way of an animal migration, simply from the absence of a highway for the poor brutes to pass from 78° to 68° North latitude, a distance of about 600 miles straight as the crow flies. Then we had the fact of the reindeer wintering in Greenland; for not even the most profound believer in an animal exodus had ever accused the poor creatures of embarking on the bosom of the waters of the Atlantic or Davis's Strait, and proceeding in the autumn to Labrador; moreover, we knew that the Dutch and Russian fishermen wintering in Spitzbergen in the old time, found the reindeer always there; at last, further doubt upon the subject was removed by the abundant testimony which poured in upon us between 1850 and 1854; and the question is now placed beyond all doubt that the deer, musk-ox, hare, and lemming of the arctic archipelago do winter in those islands.

This work not being a disquisition on natural history, it would not interest the reader to quote at length all the passages upon the subject from the different journals of officers lately engaged on arctic service; some remarked one fact, others another; so that by plodding over the ponderous blue-books, a very fair collection of data may be collected. Our gleanings are as follow:—

In the depth of the winter of 1850-51, deer, or recent traces of animals, were seen near the respective winter quarters of Captain McClure, Captain Austin, and Captain Penny; and in the early spring of 1851, when the temperature was 40° —, Lieut. Aldrich observed reindeer, white as driven snow, grazing upon what he described as stony plains covered two feet deep with snow, and

the animals so lean and winter-pulled, that no one could suppose they had been revelling on the American Continent, and had just rushed up to 76° North to enjoy a low temperature and Lents fare: they had their young fawns with them, which was an additional argument against a journey which, to and fro, could hardly be less than 2000 miles; and it is as well to remember that distance tells on animals as well as men.

Captains McClure and Kellett testify to these animals being found all the winter round, about the spots they wintered in. This narrative contains several remarkable passages, extracted from the former officer's journal upon that head; we will add one more, dated December 1852. "The deer have for the last few days," he says, "been coming from the southward to their winter quarters amongst the ravines and sandhills: ninety have been met with at one time, and forty at another; but they are so wild that few have been shot. Our two seasons' experience shows that these animals do not migrate to the south, as is generally supposed, but bear the extreme rigour of the climate, and exist upon the scanty herbage here found, chiefly that dwarf willow, from off which they break the snow with their feet, and in doing so make a tapping noise that may be heard at a considerable distance when the weather is calm, frequently leading to their discovery by our sportsmen. The hares and ptarmigan have also descended from the high ground to the sea ridges, so that a fair supply of game is brought in."

In 1853, immediately after some months of bitter temperature, the writer landed on the north shore of Bathurst Land, and was not a little surprised to observe that reindeer were very numerous on the uplands: they were browsing, with their last year's fawns, upon a miserable vegetation which any other animal would have starved upon: the only plant which they did not appear to have touched was the saxifrage, notwithstanding that the young shoots or buds are remarkably sweet, and the favourite food of the ptarmigan.

That the reindeer crosses the firm ice of the archipelago in the spring, no one can deny; but it is in search of food, not to avoid a rigour of climate which Nature has provided them with an admirable organisation to meet; but those tracks of deer, and sometimes the creatures themselves, have only been seen going in an easterly and westerly direction, between the islands of Melville, Bathurst, and Cornwallis, upon the one hand, and Melville, Eglin-

foun, and Prince Patrick, upon the other; but never in such numbers as to induce anyone to call it a migration. Deer have never been seen, or any other herbivorous animal, crossing Barrow Strait, or Melville Strait, either going north or south. Having thus disposed of the migration theory, we will next touch upon the general habits of these wonderfully constructed creatures, who, without any coating of blubber like the bear and the seal, are able to pass unscathed through a pitiless winter in a climate ranging, as far as is yet known, from zero to 65° minus, a temperature which strikes like cold steel at the vital powers of a well-clad man, and rends iron and rocks with its resistless power. *McClure's discovery, page 293.*

5. *Habits of the Reindeer.* Their average size and weight approximate mostly to those of the ordinary fallow deer of our English parks. An exceptional case is sometimes seen in some lordly stag who though, like Tennyson's "many-wintered crow," admirably fitted to lead his herd, and forming a very fine object in an arctic solitude, would be uncommonly tough and strong eating any where but in 76° north latitude. They are by no means graceful creatures at any age; the joints are large and powerful in proportion to the size of the animal; the divided hoofs are very large, and from the animal being obliged to raise its feet high when going over the snow, its gallop has none of that beautiful spring which characterises the red deer of our isles, though the pace is a telling one, and soon carries the reindeer clear of anything but the long-winded long-legged wolf.

The stags cast their antlers, and the does drop their young, in May or June, about the time of the first thaws; the males and females are then not often found together, unless it be some gay Lothario, with half a dozen admiring spinsters—an exceptional case however; and the female deer are at this season usually in small herds with their fawns; the little creatures—all eyes, ears, and legs—taking alarm at the slightest appearance of danger. The summer vegetation fattens the bucks and does amazingly, and the fawns grow apace, all three having a comparative holiday, and getting into condition to meet the trials of the coming winter, while the wolf and the fox, their sworn foes, are devoting their kind attention to the infant seals and bears, or attending to their own little domestic duties. Indeed, in the height of the arctic summer, the swampy state of the lowlands and the cutting effect of the stony hills, as shown in the state of our poor dogs' feet and

our own boots, was strong testimony against the wolf or fox being able to do much at that season against hoofed animals. As the autumn frost sets in, and the snow again spreads its pall over the death-like scenery of the north, the wolves are seen hanging in constant attendance upon the unfortunate deer.

They for protection and warmth, and following the natural instincts of gregarious animals, now commence to troop together, forming large herds of does, bucks, and fawns. Some have been counted numbering 60 head. The stags are evidently responsible for the discipline of these large herds, as well as their safety: upon the latter head, Captain Meham tells an amusing anecdote.

In October 1852, he was crossing that portion of Melville Island which intervenes between Liddon Gulf and Winter Harbour, and fell in with as many as 300 head of deer; indeed, he says reindeer were always in sight in herds varying from 10 to 60 in number. One of these herds, containing 20 head, he tried to stalk up to on the 7th October, but failed in getting a shot at them; for although the does, with the inherent failing of their sex, were extremely curious, and made one or two efforts to escape from the herds, and examine the "strange gentleman," the stags would in no wise tolerate such conduct, chastised them rather soundly with their antlers, and kept the herd together and moving, by running rapidly round and round, uttering at the same time a strange noise which seemed to alarm the herd, and keep it flying from the suspected danger.

The coat of these creatures, which during summer had become remarkably thin, and adapted admirably in colour to that of the snow-denuded soil, now rapidly thickens and again returns to its pristine whiteness. It is not a fur, in the strict acceptance of the term, but it forms an admirable non-conducting substance.

As winter advances, and food requires to be sought over larger areas, the herds break into parties of 10 to 20 animals; the lichens, a species of tripe-de-roche, the sprouts of the ground willow, as well as Iceland moss, being their principal food. It must be remembered that arctic vegetation has no time in the autumn to wither or decay; whilst in full bloom, and before the juices have time to return into the parent root or be otherwise dissipated, the magic hand of the Frost King strikes them, and thus the wisdom of the Creator has provided, for the nourishment of his creatures, a fresh and warmth-creating food, lying hid under a mantle of snow, which the instinct of those arctic animals teaches them to remove and reach the stores so beneficently preserved beneath.

There is another peculiarity worthy of notice. Most herbivorous animals have a slow system of digestion, even in a domestic state; our cattle and sheep, for instance. This appears to be still more the case in the musk-oxen, reindeer, and arctic hare, and is of infinite use in lands where the vegetation is scanty and wide spread, and the weather occasionally so severe as to oblige these creatures for two or three days at a time to look purely to their own safety by seeking shelter from the snow-storms in deep ravines or under lofty cliffs. It appears in their case as if Nature extracted from their food a greater quantity of nourishment than she does from that of animals in more southern latitudes, or possibly, by remaining in the stomach or intestines, it serves to check the cravings of appetite, although there be no further nutriment to be extracted.

Most of the musk-oxen and deer, the former especially, had their entrails distended with food (apparently quite digested), whilst the country around in many cases was as barren as a macadamised road, fairly leading to the inference that these creatures must have been a long time collecting what they had within them: and that it had been a long time swallowed, and required the vital principle of the animals to be in full activity to prevent the food from becoming a source of disease, was pretty well proved in the case of the musk-oxen, which if shot, and left twelve hours without being disembowelled, became tainted throughout with a strong musky odour rendering the flesh uneatable.

Another strong fact which bears upon the impunity with which these creatures can winter in high latitudes, is that in Lapland, where these reindeer are used for tractile purposes, it is considered quite enough food for a working animal if they are able to give it daily four pounds of lichen (*Cenomyce rangiferina*); and on that dietary a reindeer will be in sufficiently good condition to go occasionally without food for two or three days, and do that without apparent distress.

So far as food is concerned, and an organisation fitted to meet the extreme temperature of the Pole, the reindeer is thus beautifully provided; but its sorest trial must be the constant rapacity of the wolves which are ever hanging round them throughout the winter season. As the season advances the reindeer appears to resign itself to the inevitable social misery; and the cool manner in which a small flock of those creatures may be seen grazing with an *entourage* of half a dozen hungry wolves was very strange, and evinced great philosophy, to say the least of it.

A herd of deer thus surrounded by the wolves, who were too great cowards to rush in upon their prey, would be startled every now and then by the long-drawn unearthly howl of the hungry brutes: sometimes a frightened deer, horror-stricken at the abominable chaunt, dashes madly away from the herd,—away all, or a portion of the wolfish fraternity go after it. In many cases, the scene may be briefly summed up with the old three-volume *dénouement* of—a rush—a shriek—a crunching of bones, and snarling of beasts of prey—and all is over! for the wonderful powers of swallow and horrid voracity of an arctic wolf must be seen to be understood; no writer would peril his reputation for veracity by repeating what has been seen on that head. But sometimes the frightened deer gains the open country, and goes wonderful distances dogged by the persevering wolf, who assuredly has it, unless another herd is met which admits the hunted deer into its ranks.

Occasionally, whilst a herd of deer are grazing, one of them may happen to hit upon a spot where the food is plentiful; it naturally lingers there, whilst the herd is moving slowly on against the wind. The wolves immediately mark the straggler, and stealthily crawl on, their object being to cut him off from the herd: that effected, there is a howl and rush, which if the deer do not evade by extraordinary exertions, his fate is instantly sealed.

All through the winter these scenes go on, scent serving the creatures when sight is useless; and many a sportsman, in the December darkness of the Bay of God's Mercy, has often wished his olfactory nerves were as sensitive as those of the wolf, for although he could hear the deer, it was then impossible to see them, unless they moved over the dark yet snowy landscape; and many a bad shot was made by a hungry man at a large pair of sorrowful eyes which loomed out of the mist around, because he did not know whether the deer was two or twenty yards from him.

During the depth of the severe winter of 1852-53, the deer approached close to the "Investigator:" of course in doing so they quitted the land. Whether this was done with a view of seeking the warmth which instinct, if not scent, told them was being given out by the ships, which were like perfect volcanoes of heat, compared to the bitter temperature everywhere prevailing—95° below the freezing point of water—or whether it was for security against the wolves, it is difficult to say, but most probably from the former

cause; for we remember that the foxes of Leopold Harbour, in 1848, soon ascertained the fact of the warmth thrown out by the squadron under Sir James Ross, and wisely burrowed and bred in the embankments thrown up around the ships.

Winter, with its sore trials, has of course its limits; and it is astonishing how early in the new year relief comes to the harassed reindeer. In February and March the seals are breeding, and their helpless young are luscious morsels, that now commence to distract the attention of all the beasts of prey—none more than the wolf—the reindeer's holidays then commence: indeed, we must always remember that the arctic hare and lemming likewise winter in the far north, and yield occasional meals to wolf and fox.

As spring advances, the herds gradually disperse, and the deer may then be seen in twos or threes, until as I have before said, the autumn again approaches. *McClure's Discovery*, page 296.

6. *The arctic hare (Lepus Glacialis)* collects in herds or troops during the fall of the year, in the same manner as the deer. Two hundred of them have been seen at a time; and at one of their favourite haunts, Cape Dundas, Melville Island, a complete high way, three yards broad, was seen, the tread of their numbers having beaten the snow perfectly hard. In winter they burrow under the snow for protection, as well as to seek their food. Captain McClintock says, "they are every where found, but of course most numerous where the pasture is most abundant, as on Banks Land and Melville Island." The sportsmen of the "Resolute" and "Intrepid" shot 161 hares in a twelve month on the latter Island; their average weight when fit for the table was 7lbs. and from 10lbs. to 12lbs. with skin and offal. During summer the hare, as well as the lemming, seeks protection from beasts of prey under large boulders of rock or in the face of rocky ravines. The hares in summer have been seen in groups of from twelve to twenty in number. Their skin is so delicate that although the winter fur is very beautiful, and the colour a brilliant white, it cannot be applied to any useful purpose. They do not hibernate, and, strange to say the Investigators generally found them amongst the heavy hummocks of the floe-ice in Mercy Bay, as if flying to that rugged ground from the wolves or foxes. They differ from the European hare, in bringing forth five or seven young at a birth. *McClure's Discovery* page 317.

That interesting little creature, of the order Rodentia, the arctic lemming. (Myodus Lemmus)—a perfect diamond edition of the

guinea-pig—is very like the hare in its habits, but is generally found in large families. They have been seen at all seasons, and in winter are perfectly white; but feeding and living as they do under the snow, it is only the keen-nosed fox, or Esquimaux dog, that can detect their position and enjoy the sweet morsel they afford.

In summer, generally about the end of May, or early in June they have a peculiar habit of going off the land on to the frozen surface of the sea. They do not seem to have any definite object in doing so, and cannot be said to be migrating. Possibly the thaws induce them to leave the land: the seamen, in their quaint way, used to say, "Them blessed little lemmings must be arter salt, I should think, Sir!" and really there seemed to be no other way of accounting for their presence on the floe at such a season of the year. The writer often found them steering off shore from the north coast of Melville Island, leaving comparative plenty behind them, and as far as the eye could see on a clear day, from land of considerable height, there was nothing in the shape of terra firma whither they were bound. When thus exposed upon the open floe, owls, gulls, and foxes pick them up for food. Can it be that Providence occasions this exodus for the purpose of feeding these creatures, and thinning down the numbers of an animal which would otherwise multiply exceedingly, and eat up all the vegetation of a naturally sterile region?

One would hardly suppose so tiny a creature would serve as food to such large animals as Polar bears, but that it is so, the following extract from my journal will show; the place referred to being a valley on the north-east side of Bathurst Land *debouching* into Queen's Channel:—

The White Bear—Saw some shoals and the *Cub* and *Bear* Islets to seaward. Made sail to a rattling breeze, and favoured by the ice, we went along at a good pace until 3h. 30m. A.M., when, seeing some drift-wood lying about, which it was important should be examined, I halted and encamped, dispersing the men along the beach to bring all in they could find. Walking landward to obtain a view from a hill, I was startled to see a she-bear and two cubs some distance inland. Watching them carefully, I was not a little interested to see the mother applying her gigantic muscular power to turning over the large blocks of sandstone which strewed the plain, and under which the unlucky lemmings at this season take shelter. Directly the she-bear lifted the stones, which

she did by sitting upon her hams and pulling them towards her with her fore-paws, the cubs rushed in and seized their prey, tossing them up in the air in their wantonness. After repeating this operation until the young fry must have made a very good meal, I was glad to witness the bear's mode of suckling her young, a sight, I should think, rarely seen. Seated on her haunches, with the backbone arched, so as to bring the breasts (which were situated between the shoulders) as low as possible, the youngsters sucked away in a standing attitude. Anxious to secure this family party, we proceeded to burn all sorts of strong-smelling articles; and at last she brought her babes down, though very warily, and when more than 100 yards off turned away, evidently suspicious. Following her I contrived, at about 150 yards, to pass a ball (Minié) through her body, abaft the shoulder. The cubs at once made off, though I should think they had not long been born, being about the size of an Irish retriever. Joined by a couple of the men (Hall and Wicketts) who soon outstripped me, we eventually, after a long chase, came up with her; the brute, seeing she could not escape, had apparently made up her mind to wait for us behind a range of hummocks. When close to her, I learnt that they had one shot each left in their guns; and as the men longed to go in at her, we walked up, the brute most artfully hiding her body so as to get us within reach for her rush. The wonderful similarity of colour between the fur of the bear and the snow, facilitated her manœuvre, and we were within thirty yards of her when she rose. It was a ticklish moment, for the brute was venomous from desperation. The men behaved very coolly, however, merely saying to one another, "Steady!" Hall fired, but only grazed her; she still came on, when Geo. Wicketts, with my Minié (which I thought he was fully entitled to fire after so successfully bringing the brute to bay), struck her smartly in the fore shoulder. With a snap of the teeth, which it was satisfactory to know was not on ourselves, she turned round, and staggering along, fell into her lair again; and we returned to the boat to send after our dinner the small sledge for the blubber.

The she-bear was miserably lean, nothing in her stomach, and her skin in poor condition. Whilst they were skinning her, the poor little whelps ran up to be suckled; the men tried to catch them; failing in that, knocked their brains out; their little stomachs were perfectly distended with the unfortunate lemmings, which they had swallowed entire.

Perhaps the most curious fact of all, connected with the existence of animal life in high latitudes during the most severe temperatures, is that some ptarmigan are found throughout the winter in Melville Island and Banks Land. I might also add, that they have likewise been seen by officers who wintered at Beechey Island; where a small covey was flushed in the depth of the winter 1852-53. But it is best on this point to give the remarks of an officer who has had admirable opportunities of observing the fact—Captain F. L. McClintock, R. N.: he says:—

“The willow grouse never goes north of Bearing Island, the common ptarmigan (*tetrao lagopus*) is the only bird of that species found on Melville Island. They are most numerous in April, generally in pairs, and in September they collect into coveys, sometimes of as many as fifteen or twenty birds, previous to a flight southward. After that month a few were seen, and those were birds which probably had not paired during the previous season. Some ptarmigan were shot in January and February, in excellent condition; of these the largest weighed $2\frac{1}{2}$ lbs., and its crop contained $2\frac{1}{2}$ ounces of the slender shoots of the dwarf willow; many of these shoots were as thick as a crowquill, and $\frac{3}{4}$ inch long; when ready for cooking, the bird weighed $1\frac{1}{4}$ lb.; no starveling this! Six hundred and eighty-four ptarmigan were shot on Melville Island in twelve months, by the people of the ‘Resolute’ and ‘Intrepid,’ being more than the Investigators got altogether.” There is reason to believe that these hardy birds burrow under the snow for warmth, protection, and food, as the hare and lemming do. *McClure’s Discovery*, page 17.

RECENT GEOLOGICAL DISCOVERIES.

(*Supplement to the Fifth edition of Lyell’s Manual of Elementary Geology*. London: 1857.)

There is no pause in the progress of geological knowledge. The very old in the earth’s history is perpetually producing things very new to science. It is “a philosophy which never rests, its law is progress, a point which yesterday was invisible is its goal to-day, and will be its starting point to-morrow.” In accordance with this, the motto of his fifth edition, Sir Charles now presents to us a supplement of 34 pages, including a startling amount of new discovery, to some of the more important items

of which we desire to introduce those of our readers who may not yet have learned them from other sources.

First, the later Tertiaries have yielded some new facts, tending to settle the perplexed questions as to the succession of climatal changes and vicissitudes of animal life in those later geological periods which immediately preceded the advent of man; and to which our Canadian boulder clays and sands, with their marine shells, fishes, and elephantine remains, belong.

In the three later tertiary (Pliocene) deposits in England, known in ascending order as the Coralline, Red, and Norwich Crag, the marine shells show a constantly increasing percentage of recent and at the same time of northern forms; and this has just been brought forward in a precise form by Mr. Wood in the publications of the Palaeontological Society. The associated remains of land animals, however, do not appear to correspond with the gradual refrigeration indicated by the shells. This difficulty, long of a very perplexing character, is now beginning to be removed by the progress of discovery. In the first place, the sea of the Arctic shells has probably been open toward the north, while the land lay toward the south. In the next place, it has been found that the mammals of the earlier of these periods differ from those of the later. The Mastodon of the Crag is not the *M. Angustidens* of the Miocene or middle tertiary, but a distinct species. This Crag Mastodon is older than two species of elephant, a rhinoceros, a hippopotamus, and a monkey, found in Pliocene deposits in the Valley of the Thames; and these last are still older than certain ochreous gravels in the same neighbourhood, which contain remains of a third elephant, a second rhinoceros, the reindeer, &c.

Here, then, we have three distinct sets of Pliocene mammals, and the last only consists of animals properly arctic or sub-arctic. The elephant and rhinoceros (*E. Primigenius* and *R. Tichorinus*) are those found in Siberia, and known to have been covered with hair, and they are associated with bones of the reindeer and musk-ox. The discovery of this last animal is of great interest. It is now confined to Arctic America, but in the newer Pliocene period it lived in Germany and in England, along with the reindeer now its arctic associate, and with the hairy elephant and rhinoceros now extinct. Prof. Owen truly remarks, that just as naturalists could hardly credit the possibility of an elephant having lived in Siberia, until they found that it had been protected

by hair and wool, in like manner, the musk-ox, or more properly musk buffalo, is allied in its structure to the buffaloes of the warmer latitudes; and if nothing but its bones had been known, might have been supposed to indicate a sub-tropical climate. Then again, our knowledge that this creature actually lives in the extreme North, confirms our belief that the creatures once its contemporaries, notwithstanding their relation to tropical animals of our day, were suited to a cold climate.

Why is the musk-ox now confined to Arctic America, and why have its gigantic associates disappeared? No satisfactory explanation can be given. We only vaguely know that these changes have been connected with differences of climate, apparently depending on a different distribution of sea and land from that which prevails at present.

These conditions alone do not, however, present a sufficient explanation. The climate of the temperate regions of the Northern hemisphere was then colder than now. But there had been a milder climate previously, in the earlier part of the Pliocene period. Thus the time of the Siberian Mammoth and European Musk-ox stands between two milder climates, differing from each other entirely in their terrestrial fauna, but still presenting many features in common in that of the sea. When, in the present world, we pass from the Eastern continent to corresponding climates in the Western, we find different assemblages of land animals, but many identical species of sea shell-fish. It is the same when, in geological time, we pass downward beyond the cold period of the later Pliocene, to formations deposited under a climate more like the present. Such facts illustrate the comparatively limited range in time and space of most of the higher inhabitants of the land, and the almost prodigality of the creative power in the introduction of new forms of animals; but they also show that there are in the adaptation of species to climate and other conditions of existence correlations and adjustments too nice for our imperfect means of investigation.

It is strange also that the Musk-buffalo, clumsy and short-legged, should have survived so many nobler creatures, and continued to exhibit his ungainly form, ferocious temper, and unpalatable flesh, an unattractive remnant of that Pre-adamite fauna that was swept away from the old world to make room for man. Perhaps he owes his exemption from their fate to the hardy constitution and warm covering that enable him in his present north-

ern solitudes to eschew the lowland plains and thickets, and haunt the bare bleak hill-sides, which, exposed and barren though they are, suit better his short limbs, and enable him from a vantage ground to resist his enemies. His form of limb, too, appears to be especially adapted to climbing the precipitous heights which are his favorite resorts.

Passing over some new views of the sub-divisions of the tertiary series, and other items of tertiary geology, we come to the announcement that in the space of a few months, remains of seven or eight genera of mammals have been discovered in the Purbeck or Upper Oolite strata of England, and this in one small bed five inches thick, and in a very few square yards of that bed.

Hitherto the whole secondary series had yielded since 1818, when the first mammalian jaw was found in the Stonesfield slate, only six species of small mammals. Thirteen, or twice as many species have all at once appeared from this little bed of the Purbeck. The fact is significant as to the danger of deciding on what was *not* in by-gone periods. No rocks have been better explored than the secondary rocks of Western Europe. They have yielded great numbers of the bones of reptiles and fishes, yet in 36 years only six small mammals had been found. The Purbeck series itself had been carefully examined by the late Edward Forbes, and by the Geological Survey, as well as frequently ransacked by collectors, and had afforded no trace of mammals; and now all at once it proves most prolific of them.

But what manner of mammals are these ancient creatures? not huge pachyderms, like those of the tertiary era which succeeded them, but small creatures, none of them larger than the hedge hog. The greater part are insectivorous, or at least preys on small animals; two species herbivorous, with a peculiar rodent dentition, resembling that of the Kangaroo-rat of Australia. The greater number of these little animals were probably marsupial or pouched, like the prevailing quadrupeds in Australia, but some others have apparently been placental, like our ordinary mammals. Among the latter is a little creature which, according to Prof. Owen, must have been a diminutive example of that type of hoofed animals to which the hog and peccary belong.

One of the results, and not the least curious, of the Purbeck discoveries, is, that the little *Microlestes*, of the German Trias, the oldest known mammal, must have resembled the two Purbeck species of "*Plagiaulax*," which are related to the Kangaroo-rat.

This Australian animal therefore, remarkable for having its false molars developed into broad grinding-teeth, different in form from the true molars, is the representative of the oldest known type of mammalian life.

On the one hand, these discoveries show that many species of mammals must have existed in the Oolitic period. On the other, the predominance of Marsupial and Australian forms, along with the great abundance and variety of contemporary reptilian life, leads to the belief that the mammals occupied a subordinate place, and that we are really approaching the time of their introduction upon the stage. A question, however, arises here, and is plainly stated by Sir Charles, which writers on this subject have too often ignored: How far is our knowledge of a general character? and what do we know of the contemporary condition of portions of the earth to which these discoveries do not apply?

"The advocates, however, of the doctrine of progressive development will offer a different explanation of the phenomena. They will refer the large admixture of marsupials in the Stonesfield and Purbeck fauna to chronological rather than to climatal conditions,—to the age of the planet rather than to the state of a portion of its dry land. In the Triassic and Oolitic periods, they will say, the time had not yet come for the creation or development of more highly organized beings. Experience must test and determine the soundness of these theoretical views. In the meanwhile, it may be useful to bear in mind that while Australia supports at present 100 species of marsupials, the rest of the continents and islands of the globe are tenanted by about 1,700 species of mammalia, of which only 46 are marsupials (namely, the opossums of North and South America), and in like manner there flourished in the Pliocene period throughout Europe, Asia, and America, so far as we yet know, a placental fauna, consisting of species now for the most part extinct, which was coeval with the extinct Pliocene marsupials of Australia. Such facts, although far too limited to enable us to generalize with confidence, seem rather to imply that at certain periods of the past, as in our own days, the predominance of certain families of terrestrial mammalia, has had more to do with conditions of space than of time, or in other words, has been more governed by geographical circumstances than by a law of successive development of higher and higher grades of organization, in proportion as the planet grew older."

Data are wanting to supply the full answer to such a question ; and we are too apt to forget that the geological history is rather that of the existing continents and their shores than of the whole earth. Still the facts that we possess strongly indicate that lower and more general types of life once abundant, widely extended, and fitted for varied and high places in the scheme of nature, have shrunk within narrow limits in space, number of species, and range of adaptation, as higher or more specialized types were introduced. The Brachiopod shell-fish and Ganoid fishes of the Palaeozoic rocks, and the Cephalopoda and reptiles of the Mesozoic period, are cases in point ; and in like manner, the mammalian types now prevalent in Australia, may once have been general, just as the few ganoids of our modern rivers are little more than memorials of a perished race. Nor need we be surprised if the Marsupial mammals should hereafter be found to have presented in the Secondary period grander or more varied forms than the modern or Pliocene Kangaroos and their associates ; and under the same law, we may place the reported discovery, if authenticated, of a tertiary ape more nearly allied to man than any of its modern congeners.

We have not advanced sufficiently far to see the whole of truth in this matter ; and the relative importance of space and time, and the true value of types of structure in living beings, require to be carefully weighed ; yet these discoveries serve at least to inspire the hope that we shall some day attain to grand and solid general conclusions on the plan of the succession of living beings as gradually developed in the history of the world.

A curious circumstance connected with the discovery of mammals in Secondary rocks, is that nearly all the remains found have been lower jaws and teeth. The number of lower jaws exhumed has been between forty and fifty. With these have been found five upper jaws and one portion of a skull, and detached bones perhaps sufficient to complete four or five skeletons. To what circumstance does the lower jaw owe its special exemption from destruction ? or, is the whole simply one of those accidents that show us how little completeness there can be in our knowledge of fossils ? Sir Charles remarks on this point :—

“ As the average number of pieces in each mammalian skeleton is about 250, there must be many thousands of missing bones ; and when we endeavour to account for their absence, we are almost tempted to indulge in speculations like those once suggested to

me by Dr. Buckland, when he tried to solve the enigma in reference to Stonesfield :—"The corpses," he said, "of drowned animals, when they float in a river, distended by gases during putrefaction, have often their lower jaw hanging loose, and sometimes it has dropped off. The rest of the body may then be drifted elsewhere, and sometimes may be swallowed entire by a predaceous reptile or fish, such as an ichthyosaur or a shark."

"We may also suppose that when fish or other aquatic animals attack a decaying carcass, whether it be floating or has sunk to the bottom, they will first devour those parts that are covered with flesh. A lower jaw, consisting of little else than bones and teeth, will be neglected; and becoming detached, may be drifted away by a current of moderate velocity, and buried apart from the other bones in sand or mud."

There is much probability in the last explanation. Cats generally refuse to eat the heads of rats, the skulls of which may often for this reason be seen lying detached in places frequented by them; and in the castings of owls, we often find the lower jaws of mice and squirrels, that have escaped fracture and digestion better than the other bones. Small predaceous mammals or reptiles, perhaps even birds of similar habits, may have left these jaw-bones on the shores of the Purbeck lakes or estuaries, or of the rivers which flowed into them.

To pass from animals to plants, we are informed that a specimen of one of those flower-like fossils rarely found in coal measures, and hitherto of uncertain nature, though supposed by Dr. Lindley and others to be flowers, has been recognized by Mr. Bunbury and Dr. Hooker as actually a spike of blossoms, resembling those of the family Bromeliaceæ, to which the Pine-apple belongs; but it is not this particular genus that the fossil resembles. It is something to have a flower handed down to us from the carboniferous period. We can now add to our picture of the coal swamps a few bright flowers, to relieve the general sombre green of ferns and pines; and are even at liberty to hope that we may discover a butterfly that flitted amongst these ancient blossoms.

Silurian geology contributes its quota of new matter, in the views of M. Barrande respecting "Colonies" of fossils, or in other words, alternations of beds, containing the fossils of a former and later period, at the confines of the range of the new forms, where they were gradually gaining on the older, but where in the

progress of the struggle, they were in turn displaced. The changes in the occupancy of a given area in the sea bottom, must often have been of this character; and where the facts can be ascertained, they form good illustrations of the slow and sometimes interrupted manner in which new faunas, spreading from their centres of creation, have extended themselves over the earth.

M. Barrande regards the oldest or "Primordial" fauna of Bohemia as equivalent to the English "Cambrian" and to our oldest "Silurian" beds in America. Murchison, we rather think, will claim them as the lower members of his kingdom of "Siluria."*

J. W. D.

ARTICLE XXII.—*Description of some of the Fresh-water Gasteropoda, inhabiting the Lakes and Rivers of Canada.*

In the following article we have transcribed from several works descriptions of nearly all the mollusca of the family LIMNÆADÆ that are to be found in the fresh waters of Canada. Their shells are more or less abundant along the shores of all the lakes, ponds, or rivers of the country, and also constitute those valuable deposits known as shell marl. One of these beds of marl may be seen in the suburbs of the City of Montreal, where it has been laid open in the ditches crossing the Lachine Railway. Seven or eight of the species hereinafter described may be procured at that locality. In the ponds at the quarries east of the city, some of the Limnææ and Physææ are also plentiful. We have not seen the large species, *L. Stagnalis*, in this vicinity; but near the City of Ottawa, it is common in the Rideau river and canal. The figures given below are copied from an English work, but they represent our species very nearly. A few days since we showed some of the Canadian specimens to a naturalist from Britain, then on a visit here, and he said they were scarcely to be distinguished from those common in the ponds and ditches in England. Ours is not quite so much angulated upon the upper part of the whorl.

* Since the above was written we have found that a second edition of the supplement has appeared, containing other new facts among which is the discovery of mammals in the secondary rocks of America.

GENUS LIMNÆA, LAM.

Shell thin, oblong or turreted, last whorl large; aperture large, rounded before, narrowed and acute behind, outer lip sharp, inner lip forming a fold on the pillar, and usually spreading over it. Animal with short, triangular tentacula.

LIMNÆA STAGNALIS.—(LINN.)

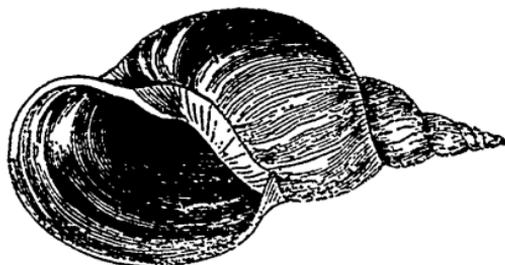


Fig. 1.

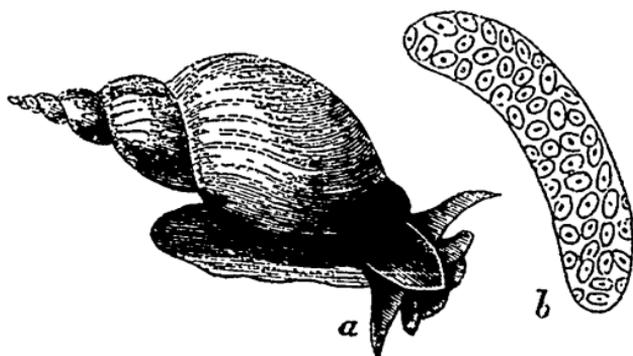


Fig. 2.

Fig. 1.—The empty shell.

Fig. 2, A.—The animal in the shell.

B.—Mass of eggs magnified.

Our shell is about two inches long, the aperture being nearly one-half of the total length. It consists of five or six whorls, of which the four uppermost are slender and tapering to an acute point. The body of the whorl is as large as represented in the figures. There is a conspicuous fold on the inner lip.

This is by far the largest *Limnæa* known in Canada, and is easily recognized by its superior size alone. *

* The remainder of this article is copied from Gould's *Invertebrata of Massachusetts*.

LIMNÆA COLUMELLA.—(Say.)



Shell ovate, ventricose, extremely thin and fragile, transparent, of a pale-greenish or yellowish color, the apex acutely pointed; whorls four, of which the last is much inflated, and composes nearly the whole shell; the upper ones are very small, forming an acute apex; surface with conspicuous and nearly regular lines of growth, minutely waved by revolving lines, some of which are distinctly elevated; suture slightly impressed; aperture large, four fifths the length of the shell, generally somewhat dilated; lip very sharp, ending with a small curve behind; on the left margin the edge is slightly turned over a minute umbilicus, and forms a considerable fold; a thin, closely adhering enamel stretches across from it to the angle of the aperture; the inner lip is so arched as to display a considerable portion of the interior of the shell. Length $\frac{3}{10}$ inch, breadth $\frac{1}{10}$ inch, divergence 68° ; of another specimen, length $\frac{1}{2}$ inch, breadth $\frac{1}{10}$ inch, divergence 56° .

Inhabits stagnant pools and miry places, and is common. It is found at maturity very early in the spring.

The *animal* is large, semi-transparent, of a dusky or light-drab color, dotted with silvery white. It is very sluggish in its motions. The head above is slightly tinted with lilac.

This very brittle shell has rather the aspect of *Succinea*, than of *Limnæa*. It varies a good deal in form, being in some specimens rather slender, and in others broad and distended. The aperture is usually somewhat dilated, especially at its broadly-rounded base; but occasionally the outer lip is pressed inwards. The surface is shining, and delicately corrugated by revolving lines.

Var. CHALYBEA. Fig. 145.



The spire is more pointed, its divergence being only 50° ; the aperture is more expanded, and the fold on the inner lip more obvious. It is thin, but not very brittle, ringing like hard-burnt crockery. The last whorl is particularly detached from the preceding one, so as to form a thread-like channel at the suture. The enamel rests loosely against the shell, and is wrinkled. The exterior is covered by a bluish-black pigment, not easily removed, and the interior has a steel-blue or black-lead color.

This shell, which I found two years in succession in a muddy

pool in Cambridge, I thought was sufficiently distinct to be regarded as a new species; and I accordingly gave its characters under the name of *Limnæa chalybea*, in Silliman's journal, xxxiii. 196. But as it has not been found in any other place, I am now disposed to regard it as a strongly marked local variety of *L. columella*. It is very possibly such a shell to which Mr. Say alludes in the "Journal of the Academy of Natural Sciences," ii. 167, as "*L. columella*, var. a. small, black, from Cold Water Creek, Missouri."

LIMNÆA MACROSTOMA.—(Say.)



Shell fragile, pellucid, light horn-colored, ovate-conical; last whorl very large, moderately inflated, surmounted by three very small, oblique ones, forming an acute apex; surface shining, marked by fine lines of growth, which are crossed and rendered flexuous by numerous revolving lines, faintly visible without a magnifier; suture distinct, the whorls approaching it by a gradual slope; aperture ovate, very ample, four-fifths the length of the shell, and, when mature, broadly expanded; outer lip very sharp and thin, broadly rounded in front, and, maintaining its sharp edge, it rises and disappears within the shell: pillar so broadly arched as to allow a view of much of the interior of the spire; a minute umbilicus is formed by a reflected scale of enamel; in mature shells a glazing of enamel is found upon the preceding whorl as it encroaches upon the aperture. Length $\frac{1}{2}\frac{1}{8}$ inch, breadth $\frac{7}{16}$ inch, divergence 73° .

This shell is closely allied to *L. columella*, and in an immature state is not easily distinguished from it; but that shell is much more elongated, and regularly tapering, the divergence of the spire being not more than 60° . Such specimens Professor Adams described as his *L. acuminata*. But at maturity the shell is very distinctly characterized by its widely spreading outer lip, which gives great expansion to the aperture. Mr. Say received it from the rice-fields of Carolina. It is the analogue of the *L. ovatus*, of Europe.

LIMNÆA DESIDIOSA.—(Say.)



Shell ovate, thin and fragile, the spire elongated and turreted; color a pale, dirty yellowish-green; whorls five, very convex, and for the most part suddenly contracted above, so as to present a conspicuous shoulder: the two or three uppermost whorls are

very small, and the body whorl about seven tenths the length of the whole shell; surface generally dead, and somewhat checked with irregular revolving and longitudinal raised lines; aperture large, usually three fifths the length of the shell, oval, broadly and sub-equally rounded both behind and before; the lip is considerably everted in front, and along the left margin, where it is not closely appressed to the whorl, and leaves a small, but evident umbilical opening; callus rather abundant; fold on the pillar slight, and smoothly rounded. Length $\frac{1}{2}$ inch, of aperture $\frac{2}{3}$ inch, breadth $\frac{3}{8}$ inch, divergence 45° .

This species is found in most regions, about the muddy margins of ponds and pools.

It is intermediate between *L. elodes* and *L. modicellus*. Its spire is proportionally more slender, its suture deeper, its aperture proportionally larger and more oval, the fold of its columella much less conspicuous, and it is a much more fragile shell than the former. The latter, while it has the large, oval aperture, the deep suture and shouldered whorls, is still more fragile, of a deep green-color, and is a short, inflated shell, with a much greater divergence of the spire, and with one whorl more than *L. desidiösa*. The habits of the two last are similar, but the animal of *desidiösa* is a much lighter green, and has not the remarkable white dots between the tentacula.

The characters of the aperture and spire seem to be constant; that is, the aperture is always large and broadly rounded behind; and the spire is tapering, the two whorls at the tip seeming somewhat as if superadded? so that if a line should pass down one side so as to touch all the whorls, this line would be concave. The only variations I have noticed are, that the suture is sometimes shallow, and the shoulder nearly wanting, so as to render the spire more regularly tapering. Mr. Say's description is not definite, and his figure is much shorter than the dimensions he ascribes to it. He gives its length seven tenths of an inch, while it rarely exceeds half an inch.

LIMNÆA ELODES.—(Say.)

Shell tapering, elongated, turreted, thin and fragile, dull and dingy horn-colored, inelegant; whorls five, or a little more, the two smallest being generally broken off; they are regularly and largely convex, not flattened or compressed posteriorly, but the adjacent margins of two whorls curve regularly to the deeply impressed suture: the last whorl,



measured upon the back, constitutes from a little more than one half, to about two thirds the whole length of the shell; surface coarsely wrinkled by the lines of growth, sometimes minutely reticulated by revolving lines, and sometimes exhibiting small, plane facets, irregularly disposed. Aperture generally less than, but never exceeding one half the length of the shell; sub-oval, rather contracted; right lip thin, with now and then a sub-marginal thickening, within colored reddish-brown; pillar margin copiously overlaid with white enamel, not closely appressed at the umbilical region; fold of the pillar large and oblique; umbilicus for the most part closed. Length $\frac{2}{10}$ inch, breadth $\frac{4}{10}$ inch, divergence 43 to 45°.

The *animal* is of a dusky-greenish color, similar to that of the shell, varying like it in intensity, minutely dotted with amber-color. Foot somewhat paler, tongue-shaped, reaching about two thirds the length of the large whorl when in motion, obtusely rounded behind.

The animal attains maturity and dies about the end of June. At this time the young may be seen with the old, about an eighth of an inch in length, and these continue to grow rapidly during the season. But after the early part of July it is rare to find an adult shell containing a living animal. At this time the exterior of the shell is much eroded; in fact the animals, as they cluster together, actually devour each other's shells; the aperture becomes white and somewhat chalky, and the brown, sub-marginal callus of the outer lip is thus covered over.

The most common species found in Massachusetts, and one which it is exceedingly difficult to describe, or to determine, if it has been already described. After much observation, and a comparison of many individuals collected from various localities, and an exchange of specimens with the most distinguished conchologists of this country, I have come to the conclusion, that it must be regarded as the *L. elodes* of Say. Its European analogue is *L. palustris*. The only Massachusetts shell which bears much affinity to it, is *L. desidiosa*, which is smaller, has a more slender spire, and larger aperture, proportionally. But it is closely related to *L. umbrosa* and *L. refléxa* of the Western and Middle States. The former is more solid, more corpulent, with the whorls and aperture more oblique, and its color darker than that of our shell. The latter has the whorls still more oblique, much less convex, forming a much less turreted and regularly tapering spire; the fold

of the pillar much less prominent, and the color yellowish. After all, these species are so nearly allied, that no description, and perhaps no figure will enable a person to determine any one of them by itself. They must be learned by comparison, and by interchanging specimens. But the difficulty does not end here. It is no easy matter to assign the limits of the species. No one presents a greater variety. The length of mature shells varies from half an inch to an inch; and it is remarkable that the largest specimens are usually the most fragile. The surface usually has an uneven, unfinished, inelegant aspect, coated with mud; but occasionally we find the conformation of the shell perfectly regular, the color a shining greenish horn-color, and the surface smooth and beautifully reticulated with longitudinal and revolving lines. It is then a very pretty, fragile shell. The aperture is small in proportion to the shell, generally rather contracted; again, we find the lip beginning to expand, and in some specimens received from Vermont, which I suppose to belong to this species, the lip is broadly flaring. Young specimens might be confounded with *L. umbilicata*, *L. desidiosa*, *L. modicellus* and *L. caperata*; but a little attention to the umbilicus, the aperture, the color, and the revolving lines will enable us to distinguish them respectively. The umbilicus is usually entirely obstructed by the overlaying callus; but in some specimens it is partially open.

LIMNÆA CATASCOPIUM.—(Say.)

Shell ovate, strong, chestnut-brown; whorls four, wrinkled, convex, the last large; suture deep; aperture sub-oval, half the length of the shell.

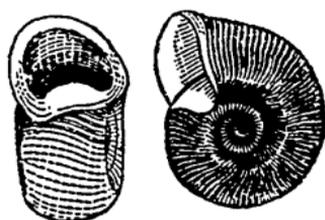
Shell rather large, oblong-ovate, ventricose, thick and strong; epidermis chestnut or brownish horn-color; whorls four or a little more, forming a short, pointed spire, delicately but rather regularly wrinkled by the lines of growth, and these are rendered somewhat corrugated by obsolete revolving lines; last whorl constituting nearly the whole shell, very much distended; suture deeply impressed; spire very short, acute at apex; aperture rather more than half the length of the shell, sub-oval, very little narrowed behind; not dilated; right lip simple, thick and regularly curved; left lip having a thick, narrow layer of enamel, and a rather slight fold midway; umbilicus not open. Length $\frac{7}{16}$ inch, breadth $\frac{4}{16}$ inch, divergence 60° .

Its great solidity, and its remarkably broad, corpulent aspect, approximating in character to *PALUDINA*, cause it to be easily recognised. Its analogue on the European continent is *L. péreger*, which, however, differs from this in being a less solid shell, in having the aperture somewhat expanded, its anterior curve broader, and the fold of the pillar less deep. It comes nearer to *L. emarginata* than to any other American species.

GENUS *PLANORBIS*, LAM.

Shell discoidal, whorls apparent above and below, aperture crescent-shaped, remote from the axis of the shell; operculum wanting; animal with thread-like tentacula.

PLANORBIS TRIVOLVIS.—(Say.)



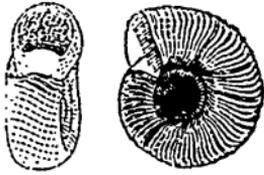
Shell orbicular, yellowish-white, brownish, or chestnut colour; umbilicated on the right side, cup-shaped on the left; on the right side scarcely three volutions, separated by a profound suture, are visible, as they disappear in the umbilicus, their faces, especially those of their interior whorls, being slightly carinated; on the left side at least four whorls are seen, which, by their faces, form a cup-shaped depression, scarcely distinguished by the suture, except the last half of the outer whorl, on the whole of which a well-marked carina revolves, forming a margin to the cup; the carina gives the whorl a flattened appearance on this side; surface covered with fine, regular, raised, transverse lines, somewhat grooved between them; aperture sub-ovate, inclining to the right, its right margin more advanced than the left, broadly and regularly rounded; left lip abruptly angulated where the carina terminates; lip usually thickened within, and of a reddish brown-colour. Large diameter $\frac{7}{16}$ inch, small diameter, $\frac{3}{8}$ inch.

Animal dark-russet or dusky, covered with pale-yellowish dots.

Planorbis corpulentus of Say seems little else than an exuberant growth of this shell. The following differences may be noted. It is at least double, often three times, the size. It is a thinner shell. On the right side the volutions are less compact, and exhibit a larger portion of each whorl; on the left side the suture is more and the carina less distinct; the aperture is much more expanded, and projects far to each side of the preceding whorl.

Inhabits the vicinity of the Great Lakes. *P. trivolvis* differs from its next species by its carina, and the position of its aperture.

PLANORBIS LENTUS. (Say.)



Shell orbicular, each whorl encircling the preceding, greenish horn-colour at the circumference, yellowish at the sides, and bordering the aperture; on the right side concave, exhibiting scarcely three rounded volutions, separated by a well-defined suture, and disappearing in a deep umbilicus; left side presents a shallow cup, formed of four compact slightly carinated whorls, distinguished by a tolerably distinct suture; surface marked with raised, sub-equidistant lines of growth; aperture large, ovate, inclining to the right; lip on the right side slightly curved, lying in the plane of that side of the shell; in front, regularly and broadly arched; on the left side, it stands out considerably beyond the preceding whorl, and undergoes a sudden curve before its junction with that whorl; the lip is sharp, very slightly spreading, and thickened within by dark reddish-brown callus. Greater diameter $\frac{7}{10}$ inch, smaller diameter $\frac{3}{10}$ inch.

Animal dark olivaceous above and below; foot oval, about one half the diameter of the shell in length, minutely dotted beneath, and frosted above with amber dots; these are abundant about the bases of the tentacula; edges of mouth honey-yellow; motions sluggish.

Found abundantly in all our ponds, small brooks, and stagnant pools.

This is a somewhat darker shell than *P. trivolvis*, and is distinguished from it by its left side and its aperture. The cup of the left side is less smooth and regular, and is not bounded by the sharp, elevated line; when this shell is laid upon its right or upper side, the lip of that side will scarcely touch the plane on which it lies, while, in *P. trivolvis*, the shell would be lifted by the lip; the aperture has not the sharp angle of the left side, produced by the termination of the carina, but in the young stages it is difficult to distinguish the two. It is very closely allied to *P. corneus* of Europe; but in that shell the left side is scarcely concave, and the suture is deep; the aperture is nearly orbicular, being almost equally rounded on both sides.

This shell has hitherto generally borne the name of *P. trivolvis* in New England; but it is not the *trivolvis* of Say, and is either his *P. lentus* or a new species.

PLANORBIS BICARINATUS.—(Rackett.)



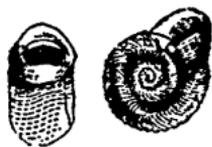
Shell orbicular, its tube rapidly increasing, deeply excavated on both sides, color brownish-yellow on the carina. Whorls rather more than three, as seen on both sides, forming on the right side a large and deep concavity, bounded by a sharp, raised line or carina, and on the left side a still deeper, inversely conic cavity, bounded by a similar carina, but of smaller circuit; surface rather smooth, with faint, irregular lines of growth, most distinct on the right side; aperture ovate, right side broadest, and on the general plane of that side of the shell; left margin strongly modified by the carina, and extending far beyond the plane of the preceding whorl; lip slightly expanded, white; interior brownish, with white lines in the grooves answering to the carina. Longest diameter $\frac{1}{2}$ inch, shortest diameter $\frac{3}{10}$ inch.

Animal light russet-color, beautifully dotted with amber; foot tongue-shaped, nearly as long as the diameter of the shell. The strong angle of the aperture fully displays the respiratory opening, which has a jagged flap, over which lies an acute groove; movements sluggish.

Inhabits still waters, not so generally pools, as the margins of large ponds. Not very common.

This species is smaller than either of the preceding, and is at once distinguished from them by the very obvious angularity of the whorls on both sides, and by the very deep, conical cavity of the left side. Sometimes a few faint revolving lines may be found on the surface. The tentacula of the animal are usually very long but sometimes one or both of them seem to have been broken.

PLANORBIS CAMPANULATUS.—(Say.)



Shell discoidal, yellowish or brownish-green, lighter at the sides; diameter of its tube nearly twice as great from side to side as in the contrary direction; right side exhibiting scarcely more than two whorls, which are elevated to an obtuse ridge, and form an umbilical vortex very nearly perforating the shell; on the right

side are four volutions, distinctly separated by the suture, which are carinated, and form a shallow, saucer-shaped depression; the whorls enclose each other in a very regular spiral to the last fifth of the outer one, when there is a sudden enlargement and distortion towards the left, by which a large, bell-shaped throat is formed; aperture also dilated, and strongly angular on the left side; within glazed, reflecting light-blue and brown; surface regularly marked with fine, transverse, raised lines, and intervening grooves. Greatest diameter $\frac{1}{2}$ inch, at right angles with this $\frac{2}{3}$ inch, small diameter $\frac{1}{3}$ inch.

This shell does not attain the size of the preceding species; and when mature, its dilated throat distinguishes it from every other known species; and the remarkable manner in which it is turned, as it were by violence, so as to look to the left, is a still further distinction. The outer whorl is everywhere of the same breadth; and the immature shell, before the dilatation of the throat, may be known by the very regular enrolment of the whorls, and the very contracted aperture in consequence of the very unequal diameters.

PLANORBIS ARMIGERUS.—(Say.)



Shell small, brownish horn-color, or light chestnut, orbicular; right side nearly plane, with only a slight central pit, showing four rounded volutions, distinctly separated by the suture; left side deeply concave, exhibiting all the whorls, which on this side are sub-carinated: surface shining, faintly marked by the lines of growth, and on the left side, may be distinctly seen several raised revolving lines on each of the whorls; aperture slightly inclining to the left, rounded, and very slightly modified by the carina, very oblique; edge of lip dark-brown; at some distance within the throat are five white teeth, nearly closing the passage; a large, prominent, oblique one is situated on the side of the preceding whorl, and may always be seen; a very small one is by its side; opposite to them are the three others which are small. Larger diameter $\frac{5}{16}$ inch, smaller diameter $\frac{1}{16}$ inch.

Animal very active, of a blue-black or slate-color; foot long and narrow. The shell is carried inclined at an angle of 45° . The respiratory groove is very acutely pointed.

Found abundantly in shady, stagnant pools and ditches, in which an abundance of decaying vegetable matter is immersed.

This common shell is well marked by its external simplicity. At the same time, the complicated armature of the aperture, so unique in this family, would seem to entitle it to be arranged as a sub-genus. It differs from the preceding in having the umbilicus on the left instead of the right side, being its natural place. Mr. Haldeman proposes to make this species the type of a sub-genus, which he calls *Planorbula*.

PLANORBIS HIRsutus.—(Gould.)



Shell small, somewhat transparent, of a brownish yellow-color: both sides concave, the left rather more than the right, but the concavity is there more limited by the presence of a sub-angular ridge on the outer whorl; whorls three, the outer one rapidly increasing; surface exhibiting traces of revolving lines when denuded, but usually covered with a dark pigment or epidermis, bristling with rigid hairs, which are arranged in close revolving lines: lines of growth very faint; aperture sub-oval, oblique, its diameter from side to side shorter than in the opposite direction; its plane very oblique. Long diameter $\frac{1}{3}$ inch, short diameter $\frac{1}{4}$ inch.

Animal has the head slate-colored above, with a darker line along each tentaculum, not originating from the eyes; foot chestnut-colored.

This *Planorbis*, though in many respects it resembles in shape *P. deflectus*, is readily distinguished from all other American species by the revolving hairy lines. It is the analogue of the European *P. albus*, from which it is difficult to designate any very characteristic difference. It is, however, a thinner shell, the last whorl increasing more rapidly; and it maintains its yellowish horn-color, whereas *P. albus*, assumes a spermacetti or still whiter appearance. The lines, too, disappear more entirely when the epidermis is gone.

PLANORBIS DEFLECTUS.—(Say.)



Shell small, distorted, compressed, of a light greenish-yellow color, something like dirty, bleached wax: right side in general convex, but with the centre slightly indented, suture distinct; left or under side concave, forming an expanded umbilicus, exhibiting about one half of each volution whorls four or five, very much compressed, and reduced to a

somewhat carinated perimeter; the last fourth of the outer whorl turns, somewhat suddenly and quite remarkably, to the left, or downwards; aperture large, ovate, lip commencing below the carina, and embracing but a very small portion of the preceding whorl; much narrower from side to side, its plane very oblique to the axis of the shell; lip simple, very slightly everted beneath; surface finely wrinkled by the lines of growth. Greater diameter $\frac{3}{16}$ inch, small diameter $\frac{1}{15}$ inch.

Animal dusky above, and with a still darker line to tip of tentacula.

Found in all our ponds, clinging to sticks, stones, &c.

It is distinguished at once, except in its very early stages, by the remarkable manner in which a portion of the last whorl is diverted from its regular course, downwards, if we consider the shell to be lying on its concave face. It is almost entirely turned off from the preceding whorls, so that the aperture comes in contact with only about half of its lower face. When immature it may be recognised by its light color and concave form. Scattered hairs may often be observed upon its surface. It has a general resemblance in its structure to *P. exactus*, but the constantly sharp edge of that species is a never failing mark of distinction. I must at present regard the *P. virens* of Adams (*Bost. Journ. Nat. Hist.*, iii. pl. 3. f. 16.) as a variety of this species, in which the last whorl is not remarkably diverted from its regular course.

PLANORBIS EXACTUS.—(Say.)



Shell lenticular, light transparent horn-color; whorls four, flattened so that the width of each is at least twice its depth, the upper and lower surfaces convex, and brought to a sharp exterior edge; the last half of the outer whorl deflected, so that the termination of the sharp edge is on a level with the lower surface of the preceding whorl; inner whorls slightly depressed, and somewhat more rounded; suture moderately impressed; striæ of growth faint; beneath abruptly umbilicated, displaying the edges of all the whorls within; aperture very oblique and angular; edge very sharp, below running forwards a little along the umbilical edge of the preceding whorl, then crossing obliquely forwards and upwards, leaving a callus, it passes off again a little below its carinated edge. Longest diameter $\frac{1}{3}$ inch, shorter diameter $\frac{3}{16}$ inch.

It is found in most brooks, ditches, and margins of ponds, which are permanent through the summer, adhering to sticks and stones.

This shell has a striking resemblance to the *P. fontana* of Europe, (Lightfoot, *Phil. Trans.*, lxxvi. pl. 2, f. 1-4. - Montagu, *Test. Brit.*, 462, pl. 6, f. 6. *P. nitidus*, Mull., Turt., &c.,) except that the aperture is entirely below the sharp edge, instead of embracing nearly an equal portion on each side, as in that shell. It is allied to *P. deflectus*, Say; but in that the whorls are more numerous, the exterior edge much rounded, the umbilical region broader and more shallow, and the labrum also embraces but half of the lower surface of the preceding whorl. Were it among the land shells it would be a most unequivocal CAROCOLLA.

I cannot but think that the name under which this shell appears in the "Journal of the Academy," is not exactly as was intended by the author, as it is neither a Latin word nor a Latin termination. Supposing that by a typographical error, an *o* has taken the place of a *t*, we have a legitimate term, and one very expressive of the form of the shell.

PLANORBIS PARVUS.—(Say.)



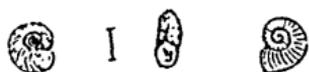
Shell very small and compressed, discoidal, light-yellowish horn-color: right side nearly plane, but excavated at the centre; left side broadly concave; whorls four, almost equally exhibited on both sides. the outer one usually somewhat angulated at its circumference; surface minutely marked by the lines of growth, shining, clear; aperture rounded, rather longer than broad, not inclining to either side, its plane very oblique; lip sharp, slightly reflected on the left side: within bluish-white. Greatest diameter $\frac{1}{4}$ inch, lesser diameter $\frac{1}{12}$ inch, but generally much smaller.

Animal whitish, dusky above, with a still darker line at tip of tentacula.

Abundant in brooks and ponds.

This is the smallest shell of the genus which we have, unless, perhaps, it be *P. excavatus*, which is commonly found of as small a size. It is not difficult to be recognised by its regular figure, and its very thin, compressed appearance. *P. deflectus*, *armigerus*, *excavatus*, and *hirsutus*, all have marked peculiarities, which at once separate them from this undistinguished species.

PLANORBIS DILATATUS.



Shell small, of a yellowish green-color, minutely wrinkled by the lines of growth; spire flat, composed of not more than three whorls, separated by a well-defined suture; the outer whorl has a sharp margin on a level with the spire, diminishing near, but still modifying, the aperture; below this line the whorl is very convexly rounded so as to encircle a small, deep, abruptly formed umbilicus. This whorl rapidly enlarges, and terminates in a very large, not very oblique aperture, with the lip expanded so as to make it trumpet-shaped. Largest diameter $\frac{3}{8}$ inch, breadth $\frac{1}{2}$ inch.

It has a miniature resemblance to *P. bicarinatus* as to its two sides, but it has only a single carina, which encircles the shell, instead of one on each side. Its large, expanded aperture, and small, deeply sunken umbilicus, readily distinguish it from any of the small species hitherto known. The surface is rather rough, and perhaps a little hispid when viewed under the microscope.

The *P. lens* of Lea (*Amer. Philos. Trans., New Series*, vi, 68, pl. 23, f. 83,) which he received from near Cincinnati, is probably the same as this shell. His name, however, is pre-occupied by a fossil species.

GENUS PHYSA, DRAP.

Shell reversed, oblong-ovate, spire prominent; aperture rounded before, narrowed and angular behind, lip sharp; inner lip twisted. Animal has thread-like tentacula, and the sharply lobed mantle is turned back upon the shell.

PHYSA HETEROSTROPIA.—(Say.)



“Shell sinistral, sub-ovate; color pale-yellow, chestnut, or blackish; whorls four, the first large, the others very small, terminating rather abruptly in an acute apex; aperture large, somewhat oval, three fourths the length of the shell, or rather more; within of a pearly lustre, often blackish; lip a little thickened on the inside, and tinged with dull red.” (SAY, in *Nich. Encyc.*) Ordinary length about $\frac{1}{2}$ inch, breadth $\frac{1}{4}$ inch, divergence 68° . My largest specimen is $\frac{7}{16}$ inch by $\frac{2}{5}$ inch.

When the shell is fresh and perfectly clean, it is always of a light greenish-yellow, and becomes a little more dusky with age.

The surface, under the magnifier, appears beautifully checkered with minute, revolving, and longitudinal lines, which are also a little waved. Sometimes there are one or more whitish, opaque bands, as if scratched by the mantle of the animal. The thickening of the lip is found only in old specimens, and in these also there is a broad layer of pearly enamel reflected over the columella, which has also a very prominent fold.

The *animal* is olivaceous, surface very smooth and silky; the foot is kite-shaped, longer than the shell, terminating in an acute point; expansions each side of the mouth acutely angled; tentacula olivaceous above, light ferruginous beneath, long and threadlike. The pointed lobes of the mantle are very conspicuous.

The motions of the animal are very rapid, and it seems to move with equal facility in an inverted posture, at the surface of the water.

The ova are excluded, enveloped in a gelatinous substance, about twelve or fifteen in number, and of an egg-shaped form. In about a fortnight they escape from the jelly, and move about with great rapidity. In fact, they are seen in motion for some time previous, apparently struggling to disengage themselves from their nidus.

This shell is everywhere to be found. Scarcely a brook or pool is met with but some of these shells will be found in it. It is more especially to be found in the running brooks.

The difference between this and *P. fontinalis* of Europe, is very slight. The spire may be a little more prolonged and acute.

It is interesting to keep a number of them in a vessel of water, and observe their motions and habits. The manner in which they open their mouths and display the lingual organ,—the manner in which they rise to the surface and open the air cavity, into which its structure permits no water to enter,—and above all, the beautiful and unaccountable manner in which it glides along, will never fail to excite astonishment. They feed freely upon any kind of vegetable.

We have here an instance of the intermirable chain of existences, and of the subserviency of one animal to another. And it is curious, too, that, in general, we have the power to elude or subdue animals of greater strength and magnitude than ourselves, much better than we can those which are inferior to us. On looking carefully about the neck of the animal of this shell, we find him beset with numerous little things looking like short,

minute, white lines, which are, in truth little parasites (*Górdius inquilinus*, Müll.) attached like leeches, and which derive their nourishment from the fluids of the animal, without his having the power to dislodge them.

Physa Ancillaria.—(Say.)



“ Shell heterostrophe, sub-globose, pale-yellowish; whorls rather more than four, very rapidly attenuated; spire truncated, hardly elevated beyond the general curve of the surface; suture not impressed; aperture but little shorter than the shell, dilated; labium a little thickened on the inner sub-margin.” (Say.) Length $\frac{1}{2}$ inch, breadth $\frac{7}{10}$ inch, divergence 90° .

Found in Connecticut and Merrimack Rivers, Fresh Pond, &c.
Animal of a bright lemon-color.

This shell is distinguished from the preceding by its much shorter spire, more angular outline, and especially by its suture, the margin of one whorl being so closely and perfectly applied to the preceding as to give the appearance of a double suture. The surface is exceedingly smooth, no revolving lines being detected by the magnifier. The base of the aperture is somewhat narrowed and prolonged downwards, and considerably effuse. The twisted fold of the columella is less conspicuous than in *P. heterostropha*. The shell becomes more ponderous and yellowish by age; and the reddish rib along the outer lip, and the enamel on the columella, much thicker.

Physa Elongata.—(Say.)



“ Shell heterostrophe, pale-yellowish, very fragile, diaphanous, oblong; whorls six or seven; spire tapering, acute at tip; suture slightly impressed; aperture not dilated, attenuated above, about half as long as the shell; columella much narrowed near the base, so that the view may be partially extended from the base towards the apex.” (Say.) Length $\frac{1}{2}$ inch, breadth $\frac{1}{2}$ inch, divergence 34° .

Animal dusky, the head above of an orange hue; tentacula rather short and blunt, lighter at tip; respiratory groove long, narrow and thin, movable in various directions, almost as long as a tentacle, with two black spots like eyes near its tip.

This species is easily recognised by its slender, elongated form, and the great proportionate length of the spire. It is in every

respect similar to *P. hypnorum* of Europe, unless perhaps, its spire may be somewhat more produced.

It is not very common in Massachusetts, and is seldom found as long as the above dimensions; while Mr. Say gives it $\frac{7}{10}$ of an inch in Illinois.

It probably belongs to the genus *Aplexus* of Gray (*Turton's Man.*, 255), which he institutes upon the elongated form of the shell, the want of auricles at the base of the mantle. This latter point I did not notice, when the animal was before me.

Mr. Say describes the animal as black, and spotless above and below; tentacula with a white ring at base. He must have observed them at a more advanced age than any I have seen living; or else the species observed are different.

GENUS ANCYLUS, MULLER.

Shell boat-shaped, without a spire, apex pointed, inclining forwards and to one side; aperture ovate.

It is not yet satisfactorily determined under what family this genus should be arranged. Its animal is closely allied to the *LIMNEANA*, and its natural relations are certainly stronger to this family, notwithstanding the form of the shell, than to the *CALYPTRA'CEA*, where it has usually been placed.

A'NCYLUS RIVULARIS.—(Say.)

Shell small, narrow, elongated-oval, the sides  nearly parallel, but one end is somewhat narrower than the other, and both are regularly rounded; apex nearly equi-distant from both extremities, nearer to, and leaning to, one side and one end; aperture oval; color dark-green. Length $\frac{1}{2}$ inch, breadth $\frac{1}{10}$ inch.

Found on stones and floating leaves in rivulets and ponds.

It is closely allied to *A. fluviatilis* of Europe; but the apex is less acute and more central. There is another American species, the *A. tardus*, Say, which has been found by Professor Adams in Vermont, but which I have not yet found in this State. It is much more rounded and conical than this, and the apex is not lateral.

A'NCYLUS FUSCUS.—(Adams.)

Shell small, very thin and pellucid, of a round oval  form, the entire outline regularly curved; depressed and regularly convex, not compressed at the sides;

apex slightly elevated, bluntly rounded a little behind, and to the right of the centre; stages of growth visible; epidermis coarse and strong, rough, dusky yellowish-brown, extending beyond the margin of the testaceous matter, and insensibly coalescing with it on all sides, which are inclined to turn upwards; within glistening, polished. Length $\frac{3}{10}$ inch, height $\frac{1}{20}$ inch, breadth $\frac{2}{10}$ inch.

Found in a rivulet in Andover by Mr. K. Prescott, of the Theological Seminary; and also found by Professor Adams in Mansfield; and by myself, in Fresh Pond.

It differs from all other described species in its depressed form, its obtuse apex, and its coarse epidermis projecting beyond the margin; and, as this extends in the direction of the plane of the object to which it is found attached, and not in continuation of the convex form of the shell, the edges seem to be turned upwards. *A. rivularis*, Say, is narrower, and has the sides nearly parallel. *A. tardus*, Say, has its apex prominent, acute, and farther behind the middle.

GENUS VALVATA. MULLER.

Shell conical, whorls cylindrical, loosely cohering; aperture circular, its margin entire; operculum orbicular.

VALVATA TRICARINATA.—(Say.)

 Shell small, depressed, thin, transparent and shining, of an emerald or light pea-green color; whorls three or four, flattened at the summit, faintly marked by lines of growth, and separated by a distinct suture; each of the interior whorls has one or two prominently raised, rounded, revolving lines or keels, and the exterior one has three, one of which issues from the lower junction of the lip and borders the umbilicus; a second originates from the upper junction of the lip, and circumscribes the whorl; the third midway between this and the suture, thus giving the whorls a prismatic or quadrangular instead of a cylindrical appearance; aperture circular, modified by the keels; lip simple, surrounding the aperture, except a small space between the two lower keels; umbilicus broad, deep, tunnel-shaped. Height $\frac{1}{10}$ inch, breadth $\frac{7}{10}$ inch.

It is found in most of our small lakes, usually under stones, or sheltered by the deserted shells of some of the fresh-water mussels.

The shell is usually rendered somewhat opaque by an earthy coating, which seems to answer the purpose of an epidermis; but,

when this is removed, the surface is shining and pearly, of an emerald-green color, lighter on the keels. It is one of our most curious shells.

VALVATA PUPOIDEA.—(Gould.)

 Shell small, elongated-ovate, opaque, chestnut-colored, when divested of the rough, dirty pigment which usually adheres closely to it; whorls four or five, minutely wrinkled,  the posterior one small and flattened so as to form an obtuse apex; the others cylindrical, and so partially in contact as to expose about one half of the cylinder; the last entirely disjoined from the preceding one for at least the half of a revolution; aperture circular, lip simple and sharp; on looking at the shell from below, no umbilical opening is found; operculum horny, apex central, elements concentric. Length $\frac{1}{10}$ inch, breadth $\frac{3}{10}$ inch.

Found at Fresh Pond and other ponds, on stones and submerged sticks; and has been for many years in our cabinets marked as a PALUDI'NA.

Animal very active; head probosciform, half as long as the tentacles, bi-lobed in front, dark, terminated with light; tentacles rather stout, light drab-colored, with a line of silvery dots on the upper side, over the large, black eyes; foot, tongue-shaped, as long as the first whorl, dilated into two acute angles in front, light drab-color; respiratory organ occasionally protruded to half the length of a tentacle on the right side.

This species is widely distinguished from all other described ones by its minuteness, its elongated form, and its want of an umbilicus; of which characters the last two seem to arise from the loose manner in which the whorls are united.

AMNICOLA PORATA.—(Say.)

  Shell minute, conic-globose, thin, translucent, smooth, or with most delicate lines of growth; varying from a bronze-green to a light olive-green color, but usually invested with mud; whorls four or less, very convex, and flattened near the suture, so as to present a conspicuous shoulder; the last whorl rather more than two thirds the length of the shell, and as broad as long; suture deeply impressed, almost channelled; aperture nearly circular, both lips being about equally curved, and uniting posteriorly at a broad angle; lips sharp, in some instances a little everted; inner lip, at maturity, barely

touching the preceding whorl just before it joins the outer lip, leaving a very large, deep umbilicus. Length $\frac{3}{8}$ inch, breadth $\frac{5}{16}$ inch, divergence 68° .

Found in ditches and brooks, clinging to stones or submerged plants, oftentimes in great numbers.

Animal a light drab color tinted pink, the head a little flesh-colored above; tentacula silvery, with a dark line running along the outside from the eyes, which are at the external base; foot not reaching beyond the first whorl, broadly rounded behind, dilated into angles at each side in front; head half the width of the foot, and projecting beyond it, motions very slow. In delicate and clean specimens, a dark mark parallel to the outer lip, and another bisecting it, and belonging to the animal, appear through the shell.

Under this species I include all the small shells, hitherto regarded as PALUDINÆ, which are collected in this region, ascribing the very great differences they present in color and size to differences of locality and age. The shoulder of the whorls, the conspicuous umbilicus, and the rounded aperture, almost like VABVA'TA or CYCLOSTOMA, are the most obvious characters. It is less solid, less elongated, the aperture more circular, and the inner lip much less closely appressed to the preceding whorl than *P. limosa* Say. *P. lustrica*, Say, is described as much smaller, much more elongated, and more cylindrical. This I strongly suspect to be identical with *valvata pupoidea* in an immature state. It approaches nearest to *P. Cincinnatiensis*, Anthony, which is larger and more conical and elongated.

ARTICLE XXIII.—On the Order Lepidoptera, with the description of two species of Canadian Butterflies.

On reference to the classification of the Animal Kingdom, published in the first number of this magazine, Feb. 1856, p. 26-31, it will be seen that the second Department or Division *Articulata* is divided into three classes: *Insecta*, *Crustacea*, and *Annelides* (or worms). The first of these three classes is further divided into three sub-classes, viz.: *Manducata* (or Mandibulata,) insects with jaws; *Suctoria* (or Haustellata,) insects with a sucker; and *Aptera*, or wingless insects. The second of these sub-classes con-

tains several orders, viz. : *Lepidoptera*, or Butterflies and Moths ; *Diptera*, or two-winged flies ; and *Hemiptera*, bugs, boat-flies, &c. The present article deals with the first of these orders. In future numbers we shall probably give a sketch, not only of the remaining orders of Suctoria, but also of Mandibulata and Aptera.

INSECTA HAUSTELLATA.—ORDER LEPIDOPTERA.

Butterflies and Moths are distinguished from all other insects, by having the wings clothed with scales. The scientific term "Lepidoptera" is derived from two Greek words, *lepis*, a scale, and *pteron*, a wing. Their wings are not transparent like those of a bee, a fly, or a dragon-fly, nor are they horny like the elytra of a beetle, but both surfaces are thickly covered with small scales, which are easily removed, and laid one over the other with great regularity like tiles on the roof of a house. If these be rubbed off, the membrane of the wing is left entirely colourless. It is to these scales, therefore, that they owe the splendid colours which render them the objects of such universal admiration. The order is divided into two great Sections : 1. Rhopalocera, containing the *Butterflies*, and of which we shall presently treat ; and 2. Heterocera, which includes the Hawkmoths, Bombyces, Noctuæ, Geometræ, &c. ; or, in short, all the Lepidoptera not having a knob to the antennæ. They all alike pass through the stages of egg, larva, pupa, and imago ; and the larva, or Caterpillar, changes its skin several times before it becomes full fed, when it changes to the Pupa, without legs and motionless, frequently forming for its protection in that state, a cocoon of silk, which, in some species, has been an article of commerce from the earliest ages. Want of space compels us to conclude this brief and imperfect sketch of this interesting order, which is supposed to contain more species than any other except *Coleoptera* ; and we now proceed to the consideration of the

SECTION I.—RHOPALOCERA, *Boisdural*.

LEPIDOPTERA DIURNA, *Latrielle*. (BUTTERFLIES.)

The Diurnal Lepidoptera, or Butterflies, corresponding with the Linnean genus *Papilio*, are distinguished from all other Lepidoptera, by having the antennæ long and slender, and terminated by a knob, or club.* In the *Hesperidæ* this club is hooked at the

* Certain foreign genera, however, such as *Morpho* and *Urania*, form an exception to this rule, as they have antennæ either of equal thickness throughout or tapering slightly at the summit.

tip. They are also destitute of the bristle at the base of the anterior edge of the second pair of wings, which in the moths passes through a loop in the under side of the fore wings, retaining them in their proper position during flight. The wings when at rest are, with a few exceptions, carried erect over the back, their upper surfaces being brought into contact. Their flight is invariably diurnal, and they are always furnished with a proboscis or tongue. The under side of the wings is generally equally ornamented with the upper, and frequently exhibits a different pattern. Their Caterpillars are constantly furnished with 16 feet (6 thoracic, 8 ventral, and 2 anal.) They are frequently smooth, but are generally armed with sharp branched spines and other appendages. Their chrysalides are almost always naked, attached by the tail and often by a girth of silk round the middle of the body. They are often angular in their form, scarcely ever enclosed in a cocoon, and a few are subterranean. They are variously and sometimes handsomely coloured, and many present those metallic hues from which the terms "Chrysalis" (*chrysalis* gold,) and "Aurelia" (*aureus*, golden) take their origin. The word "Butterfly" is a literal translation of the Saxon word, *Buttor-fleoze*, and is supposed to be applied because the insects first became prevalent at the beginning of the season for butter. Butterflies are the most generally and familiarly known of all the insect tribes; and by their conspicuous appearance, and splendid colours, seldom fail to attract the notice even of those whose perceptions are least alive to the beauty of natural objects. The species are very numerous; between 2000 and 3000 have been described, and it is probable a very considerable number remain undiscovered. In the larva state they feed on a great variety of plants, from the towering oak of the forest to the humble cabbage of our gardens; but, in their perfect form, they derive their sustenance entirely from the nectareous juices of flowers and fruits. It is worthy of remark, that most of the principal groups are characterized by the prevalence of particular hues; thus, the greater portion of the genus *Pieris* is white; *Colias*, various shades of yellow; *Argynnis*, almost invariably fulvous or reddish brown; the *Lycæna*, are mostly fulgid copper colour; and the *Polyommata*, are either blue or brown.

The Diurnal Lepidoptera are divisible into the six following families, all of which are represented in North America:—

- | | | |
|-----------------|--|---------------|
| 1. Papilionidæ, | \| | 4. Erycinidæ, |
| 2. Heliconidæ, | \| | 5. Lycænidæ, |
| 3. Nymphalidæ, | \| | 6. Hesperidæ. |

The last family differs from all the others in the habit of the caterpillars rolling up leaves, within which they undergo their transformations.

FAMILY I.—PAPILIONIDÆ. LEACH.

This family consists of some of the most gigantic species of Butterflies, distinguished by the perfectly ambulatory structure of all the six legs, the anterior pair not being more or less rudimental; the hind tibiæ have only a single pair of spurs at the tip; the tarsal ungues or claws are distinct and exposed, single or bifid; the antennæ are never hooked at the tip, the club being distinct, but variable in form; the palpi are variable, but the third joint is never suddenly slenderer than the rest and naked; the discoidal or central cell of the hind-wings is always closed behind by a nervure; the abdomen is short, slender, and often laterally compressed; the proboscis short, or moderately long. The Caterpillars are elongated, nearly cylindrical, but are frequently thickened or shortened, and are either smooth or pubescent, rarely spinous; the Chrysalides are attached, not only by the ordinary anal hooks, but also by a girth round the middle of the body. In one genus (*Parnassius*) it is, however, inclosed in a rough cocoon. Almost all the Butterflies of this family are powerful fliers, and it frequently requires a good chase to capture specimens of some of the species.

This numerous family is divided into two very distinct sub-families—*Papilionidi* and *Pieridi*—both of which are well represented in this country.

SUB-FAMILY I.—PAPILIONIDI. STEPHENS.

Anal edge of the hind wings concave, or cut out to receive the abdomen; the anterior tibiæ have a spur in the middle; the tarsal ungues or claws are simple; they are furnished with very powerful muscles at the base of the wings, which are very large and their flight rapid. The Caterpillars are slow, cylindrical, thickened, and never villose or hairy, but a few are armed with spines. They are always furnished with two fleshy retractile tentacles in the form of a Y, issuing from a common tubercle, upon the back of the segment succeeding the head, which the insect throws out when alarmed, emitting at the same time an acrid liquid with a disagreeable odour. This curious organ is supposed to be intended as a weapon of defence against Ichneumons and other parasites, to the attacks of which they are very subject.

From the beauty of their colours, the insects of this sub-family were styled by Linnæus, in his fanciful arrangement of the Butterflies, Equites or Knights, and were divided into two sections; those with black wings, and spotted with red on the breast, forming the first group, Equites Troes or Trojan Knights; and those which are destitute of these markings, but are ornamented with an ocelated spot on the anal angle of the hind wings, constituted the second, Equites Achivi or Greek Knights. In modern arrangements it is formed of several genera, of which only the typical one, *Papilio*, occurs in North America.

GENUS I.—PAPILIO. LINNÆUS.

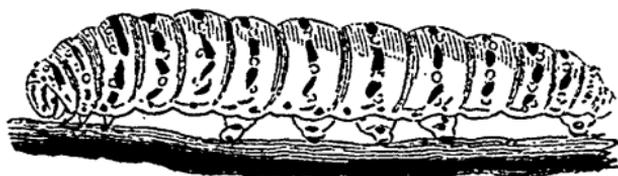
Antennæ rather long, with a moderately large oval and gradually formed club, which is somewhat curved and not compressed; Palpi very short, not projecting beyond the head, all the joints very indistinct, and the third or terminal one very minute and hardly visible; tongue long; eyes large and naked; abdomen rather short and ovate conical; wings strong and elongate, more or less toothed at the edges, the posterior pair being often produced into a long point or tail, from whence they have obtained the name of "Swallow-tailed Butterflies," and having the inner margin folded upwards so as to allow of the free motion of the abdomen; the strong central nerve of the fore wings emits four branches behind, and the middle cell of the hind wings is closed and emits six nerves. The first pair of legs are alike in both sexes—the two fore legs being fitted, as well as the four hind ones, for walking; the anterior tibiæ have a single strong spur at the middle, the four posterior tibiæ have two long spurs at the tip of each. The anal valves of the male, of moderate size. Larvæ naked, never pubescent, and furnished on the neck with a fleshy furcate tentacle, which they are able to retract or exert at will. In a very large number the two first segments are attenuated and capable of being drawn in under the third and fourth, which are swollen, and often ornamented with ocular spots. The Chrysalides are attached by the tail, and girt round the middle by a silken thread, with the head pointing upwards, and forked or bimucronate.

This genus is extremely numerous—Boisduval having described 224 species, exclusive of several which he has detached under other generic names. They are mostly of large size, and are found in almost every quarter of the globe. They are more nu-

merous in the new world than in the old, but the difference is by no means considerable. In the former, Brazil alone produces between forty and fifty species; and in the latter, the greatest number occur in the islands of the Indian Archipelago, which is also the natural country of the magnificent Ornithoptera, (another genus of the Papilionidæ.) The continental parts of India, China, Java, &c., likewise possess many fine species, and a few are found in New Holland. Europe is exceedingly poor in insects of this group—only three or four species being indigenous, of which but one is found in England. Boisduval describes twelve species as inhabiting North America. They all have the hinder wings tailed, excepting *P. Polydamas*. Only two species, we believe, occur in the Canadas, viz., *P. Asterias* and *P. Turnus*. We are not aware that *P. Troilus*, *Glaucus*, *Calchas*, or *Philenor* inhabit any of these Provinces, though it is not unlikely that the first at least occurs in some of the more southern portions, as it is included in lists of insects inhabiting Massachusetts. Our two species are very readily distinguished from each other, not only in the Imago, but also in the Larva, as they are of a different shape, as well as ornamented in a very different manner.

SPECIES I.—PAPILIO ASTERIAS. BLACK SWALLOW-TAILED BUTTERFLY.

Plate iii., fig. 2, male; fig. 3, female.



a



b

a. The Caterpillar. b. The Chrysalis.

Clerck Icones, t. xxxiii, fig. 3, 4; Holmiæ, 1757-1762.
P. Asterias, Fabricius, Entom. Syst. Em., t. iii., pars I, p. 6, n.

16, Holmiæ, 1792-1794; Mant. Insect. t. ii., p. 2, n. 13, Hafniæ, 1787.

P. Asterias, Godart, Encyclop. Ins. t. ix., pars. 1, p. 58, n. 91, Paris, 1819-1821.

P. Asterias, Boisduval and Leconte, Ico., &c., des Lepidoptères, &c., de l'Amerique Sept. t. 1, p. 14, pl. 4, fig. 1-4, Paris, 1833.

P. Asterias, Turton's Linné, p. 8, vol. iii., London, 1806.

P. Asterias, Emmon's Agri. New York. Insects, p. 200, Albany, 1854.

P. Asterius, Cramer, Pap. xxxiii., p. 194, pl. ccclxxxv., fig. c. d., Utrecht, 1782.

P. Troilus, Smith and Abbot, the Nat. Hist. of the rarer Lepid. Ins. of Georgia, vol. i., p. 1, tab. i., London, 1798.

DRURY INSECT 1, tab. ii., fig. 2. London, 1770-1775,

Male.—Wings denticulated, black, with two spotted bands of a pale yellow; the first, placed a little beyond the middle of the anterior wings, is composed on the latter of eight more or less triangular spots; it then traverses the middle of the posterior wings, where it is only interrupted by the nervures, which are very strong and distinct; the second, entirely marginal, is composed of spots more interrupted and smaller than in the preceding; upon the fore wings it is formed of eight or nine spots, and on the hind wings, by six, mostly lunules. Besides the two bands already mentioned, there are two large yellowish dots before the first band on the anterior wings; and upon the posterior wings, between the yellow bands, six or seven blue lunules, of which the upper ones are less determined; and lastly, at the anal angle a rufous spot, marked in the middle by a black dot. The notches of the wings are bordered with yellowish, and the tails are black and rather short.

The under side of the fore wings is paler than the upper, but presents precisely the same markings; the first band, however, is of a pale fulvous instead of being yellow, with the exception of the two or three first triangular spots, which are frequently of the same tint as on the upper side. The under side of the hind wings is much like the upper, as to the design, but the two bands are of a reddish orange, with the exception of the two last spots, which are yellowish like the upper side. The body is black, with three series of yellow spots on the sides; two small dots on the

hind head, and two on the front of the thorax. Antennæ black, and rather long. Expansion of the wings about 3 inches.

Female.—Very similar to the male, but differs in having the first band formed of smaller dots, and sometimes they are almost obsolete on the inferior wings, whilst the blue lunules are larger and more distinct. Expansion of the wings, about $4\frac{1}{2}$ inches; but, in many specimens, there is little difference of any kind between the two sexes.

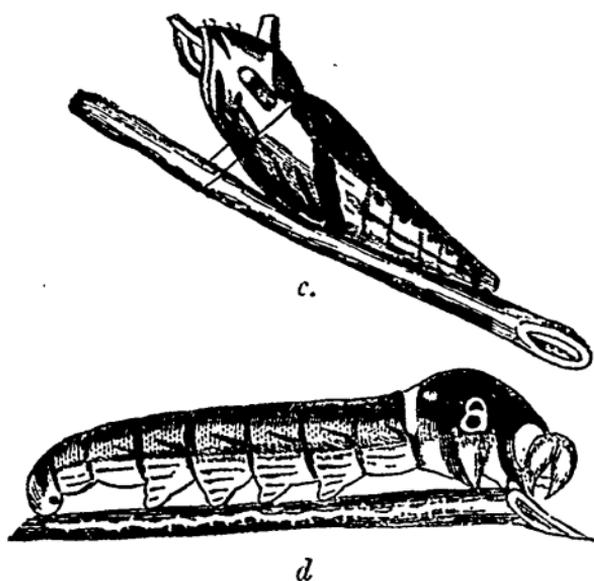
The Caterpillar very much resembles that of the English *P. Machaon*. It is of an apple green, with a transverse band upon each segment, formed by alternate black and yellow spots, except upon the three first, where the black band is only interrupted by the yellow points towards the stigmata. Whilst upon the back they are in front of the black band, and not in a line with it. Besides this, there are three black dots upon the anterior part of the first segment, and two lines of the same colour upon the head. The feet have the crown or suckers black, with a spot of the same colour at the base. Like all the other larvæ of this genus, it is furnished with an orange-coloured forked organ on the top of the segment behind the head. The figure in Boisduval's work on the North American Butterflies is not well coloured, and does not give a good idea of it. This Larva lives on the carrot (*Daucus carota*,) upon fennel (*anethum feniculum*,) and upon many other of the Umbelliferae. About Montreal we have frequently met with it in gardens, on Parsley, and on a plant called "Everlasting Celery." Emmons mentions it as being found in the month of June, whilst we have observed it at the beginning of September; but there are two broods in the year, the autumnal one passing the winter as pupæ and producing those specimens of the Butterfly which we first see in Spring.

The Chrysalis is at first pale green, but soon changes to brownish white, with darker markings. The summer brood or broods (for Boisduval says there are three during the season) pass only about a fortnight in the pupa state. This species is so very subject to the attacks of Parasites that out of seven pupæ which we kept one winter, not one produced the butterfly, but from each came out a large Ichneumon, with red body and legs, and steel blue wings, which made its escape by gnawing a large round hole in the side of the pupa. When the chrysalides are kept in a warm room through the winter, this parasite will often make its appearance as early as January or February.

The Butterfly frequents gardens, the vicinity of habitations, and every place where the umbelliferæ grow. It is common in Newfoundland, Virginia and Georgia, and is also found in the West Indies, and even in South America. It is however remarkable, that, although so numerous about Montreal, we have never observed it either at Sorel or Quebec, and Mr. Gosse did not meet with it in the Eastern Townships. It is said to be somewhat irregular in its appearance, being more abundant in some years than in others. It is not so strong a flier as *P. Turnus*, and is much more easily captured.

SPECIES II.—PAPILIO TURNUS.—TIGER SWALLOW-TAILED BUTTERFLY.

Plate iii, fig. 1.



c. The Chrysalis. d. The Caterpillar.

P. Turnus, Linné, Mant., p. 536, Holmiæ, 1771.

P. Turnus, Fabricius, Syst. Entom., p. 452, n. 41, Flensburgi, 1775.

Spec. Inc. t. ii, p. 16, n. 66. Hamburgi, 1781.

Mant. Ins., t. ii, p. 9, n. 76. Hafniæ, 1787.

Entom. Syst. Em., t. iii, pars. 1, p. 29, n. 86. Hafniæ, 1792-1794.

Herbst, Pap., t. xli., fig. 3, 4. Berlin, 1785-1806.

P. Turnus, Godart, Encyclop. method. Ins., t. ix., pars. 1, p. 56, n. 87, Paris, 1819-1821.

P. Turnus, Palisot de Beauvois, Ins. recueillis en Afrique et en Amer., vii. livrais, pl. ii.

P. Turnus, Hubner, Exot. Ausburg, 1806, &c.

P. Turnus, Boisduval, t. 1, p. 20, pl. 6, 7, fig. 1, 3. Paris, 1833.
Emmons, Agri, New York, p. 201, pl. xxxviii., fig. 3.
Albany, 1854.

P. Alcidas, Cramer, Pap., p. 62, pl. xxxviii., fig. A, B. Utrecht,
1782-1791.

This Butterfly is one of the largest of all those which are found in the New World. It is shaped like the English *P. Machaon*, but is very differently marked. All the four wings are pale yellow, with a rather broad black border. The anterior wings have the base, costal edge, and the nervures black. They have also four black transverse stripes: the first extending all across the wings from the costa to the inner margin; the other three are abbreviated. The border of these wings contains nine yellow spots. The posterior wings have an oblique linear band across the middle, from the costa to the anal angle, and joining the first stripe of the upper wings, and the nervure which closes the central cell is strongly marked with black; the inner margin is also black. The centre of the black marginal band is considerably powdered and tinged with blue, and contains six lunules, of which the first and last are fulvous, and the rest yellow. The anal angle is ornamented with four lunules respectively—yellow, black, blue and fulvous. The fore wings are slightly, and the hind wings very strongly, dentated; the notches of all are edged with yellow. The "tail" is moderately long, swollen at the tip and black, bordered on the inner side with yellow. The markings on the under side of all the wings are nearly the same as on the upper, but the colours are paler and more diffused; the black being considerably powdered with yellow scales, giving it a greenish tint; the yellow spots of the marginal band of the anterior wings are run into each other, forming a narrow stripe, bordered on each side by a blackish band. The lunules of the posterior wings are fulvous and the blue is more determined, and forms a narrow band separated from the fulvous lunules by a band of greyish black. The head, antennæ and legs, are black; palpi, yellow; thorax and abdomen black, longitudinally striped with yellow. Expansion of the wings, between 4 and 5 inches.

The Caterpillar is a fine velvety green on the back, whitish underneath, and the sides are whitish green, with seven green stripes placed obliquely. Between the fourth and fifth segments on the back, there is a transverse band, yellow in front and black be-

hind; the third segment is ornamented on each side with a yellow eye-like spot, containing two blue pupils; the head is flesh-coloured, with the collar yellow. It feeds on a great many plants of the genus *Prunus*, principally on *Prunus Virginianus*, and *Prunus Serotina* (Choke-cherry.) Abbot frequently met with it on *Ptelea Trifoliata*; and Mr. Gosse in that charming work, the "Canadian Naturalist," mentions that he has taken it from willow, poplar, and bass-wood (*Tilia gl bra*.) but chiefly from brown ash; and that the young larvæ are bluish grey at each extremity, and white in the middle. He also says that "it spins a bed of silk so tightly stretched from one edge of a leaf to the other as to bend it up, so that a section of it would represent a bow, the silk being the string. On this elastic bed the larva reposes, the fore parts of the body drawn in so as to swell out that part of the body on which the eye-spots are very conspicuous." "Before it spins its button and suspending girth, it gradually changes colour to a dingy purple." The larva may be found in July and September. The Chrysalis is brown with many darker blotches, and has a conical point on the breast. This Butterfly appears twice in the year, those of the first brood having passed the winter in the pupa state. It is abundant throughout Canada and the United States from end of May to end of July, and is found from Newfoundland to the Gulf of Mexico, and perhaps further.

In the early part of a Canadian summer, when the fragrant Lilacs are in full bloom, it is a glorious sight to see the tiny Humming birds flying over the blossoms in company with this splendid Butterfly, which is very partial to the flowers of that plant. It has, like many other species, a habit of assembling in numbers round wet places on roads, &c., and Mr. Gosse speaks of as many as fifty-two being seen together in one spot.

Explanation of the technical terms used in the description of the Butterflies:—

OUTLINE OF WING.—*Costa*, the front edge of each wing—*base*, the part of the wing nearest the body—*hind margin*, the edge furthest from the body—*inner margin*, the edge opposite the costa—*tip*, the part where the costa meets the hind-margin—*anal angle*, where the hind-margin meets the inner-margin.

MARKINGS.—*Longitudinal*, extending in the direction from the base to the hind-margin of the wing, or from the head to the tail of the insect—*transverse*, extending from the costa to the

inner-margin of the wing, or from one side of the body of the insect to the other—*spot*, a regularly shaped marking of moderate size—*dot*, a minute round spot—*band*, a transverse marking, wider than a line and of uniform width—*line*, a fine thread-like marking, of uniform width—*streak*, *stripe*, an elongated marking not necessarily of uniform width—*lunule*, a crescent-like mark or spot—*abbreviated*, cut short—*anal*, of or belonging to the tail or that end of the body opposite the head—*anterior*, that which is in front or nearest the head—*before the middle*, between the middle and the base of the wing—*behind*, *beyond the middle*, between the middle and the hind-margin of the wing—*bimucronate*, having two sharp points—*concave*, that which is hollowed out, when the margin of the wing is curved inwards—*convex*, when the margin of the wing is curved outwards—*denticulated*, toothed or notched—*dorsal*, of or belonging to the back—*fulvous*, orange-tawny, or orange with a brownish tinge—*furcate* with two prongs or forked—*lateral*, of or belonging to the side—*oblique*, that which goes in a slanting direction—*ocellated* that which has a spot with a pupil, or eye-like centre—*ventral*, of or belonging to the belly.

PARTS.—*Antennae*, the horns—*medial nervure*, the middle rib vein, or nervure, between the costa and the inner margin—*nervure*, rib, vein, or nerve, the framework of the wing—*palpi*, the feelers, parts of the mouth—*segments*, rings or divisions of the body of the insect (a caterpillar consists of thirteen segments numbered from the head which is the first)—*spiracles*, *stigmata*, the breathing holes of the caterpillar placed along the sides above the feet—*tarsus*, the terminal portion of the leg—*tentacles*, (in the caterpillar) feelers like those of snails, &c.—*thorax*, the second part of the trunk or body, that part to which the wings are attached—*tibia*, the third portion of the leg—*tubercles*, small wart-like protuberances—*ungues*, claws.

NOTE. I had not an opportunity of examining a sufficient number of specimens, of the common Lackey or Apple moth, which is so destructive to the foliage of the trees round Montreal, to determine with accuracy the species to which it belonged, until after my article on "insects injuring the crops in the vicinity of Montreal" was in type. Having lately compared recently captured specimens with the descriptions in Dr. Fitch's reports, I have come to the conclusion that it is *Clisiocampa Sylvatica*, (Harris) and not *C. americana* as previously stated. The date of the article also was accidentally omitted. It was communicated to the Natural History Society, at its monthly meeting, June 29th. To enable non-entomologists to recognise that useful insect *Calosoma calidum*, I subjoin a short notice and description of it.



Calosoma Calidum. See page 163.

This fine beetle belongs to the first division (Geodephaga) of the order of Coleoptera. The geodephaga or carnivorous ground beetles are so termed from their habit of living principally on the ground, and feeding in all their stages on other insects. The division is divided into two families. 1st. Cicindelidæ or Tiger Beetles, several species of which are very abundant about Montreal, flying in the sun on sandy places; and 2nd. Carabidæ which includes all the other geodephagous insects. There are a vast number of species in this country, all more or less useful in keeping down the numbers of noxious insects; but the present, conspicuous from its large size and great strength, is the most beneficial to us. The genus *Calosoma* to which it belongs contains many large species and most are splendidly ornamented with metallic tints. A great number of the Carabidæ are destitute of wings under the elytra, but this species and the rest of its genus are amply provided with the organs of flight, which enables them to follow their insect prey with greater facility on trees as well as on the ground. *CALOSOMA CALIDUM*, copper spot carab; black, all the joints of the antennæ except the four basal ones clothed with piceous hairs; sides of the thorax and elytra minutely punctured; the punctures green; elytra deeply punctate-striated, each with three rows of deep impressions, and one or two (sometimes more) at the base near the suture, of a brilliant copper colour. Length from ten to twelve lines. Professor Emmon's figure in his work on the Insects of New York is so bad that it is impossible to identify it.

Montreal, July 23, 1857.

W. S. M. D'URBAN.

The American Association for the Advancement of Science.—The advent of the distinguished men who constitute the members of this society, and the other illustrious foreigners who have been invited to meet them in the city of Montreal in August next, will be one of the most important and interesting events that has ever occurred in Canada. We well remember when, at a meeting of the Council of the Natural History Society held during the winter of 1856, the propriety of appointing a delegation to represent the Society at the Albany meeting of the Association, was suggested and proposed. And when its present President, Mr. Principal Dawson, hinted that Montreal would do well to invite the *savans* to make that city their next place of meeting, we recollect the doubts that were expressed and the difficulties that were thought to lie in the way of such an offer being accepted. It was said for example, that the American members would never consent to the Association assembling on this side of the line '45°, and it was strongly urged, certainly with more of truth than poetry in the argument, that the Natural History Society, a paralysed, helpless and almost hopeless institution, struggling hard for its very existence, to invite an Association so active and energetic, so distinguished and so full of vitality, would not only be a shock to modesty, but a proceeding which if favorably received, would place the Society in the most awkward difficulty of providing ways and means in accordance with its obligations, to accommodate and entertain the Association so invited. The dissentients were hard to satisfy, but they were at length convinced. The quiet but telling and practical arguments of the President brought them over. There was no knowing what might be the results of such a meeting, what its good effects alike to the aged professor and the very tyro in science. To bring here so many of the learned in this continent to meet together in social communion, for the interchange of great thoughts, would re-animate the dry bones of our society and make it again live. The excitement would not pass at once away; the influences would not be transient, but abiding; they would be with us long; we trust they will never leave us; and that (to use the words of an eminent philosopher speaking of the great sister Society, the British Association.) whether the mathematician's study, or the astronomer's observatory, or the chemist's laboratory, or some rich distant meadow unexplored as yet by botanist, or some untrodden mountain top, or any of the other haunts and homes and oracular

places of science, be our allotted place of labour, till we meet together again, these influences will operate upon us all, and make us look forward with joyful expectation to our next re-assembling, and by the recollection and the hope, be stimulated and supported.

The delegation, having been named, and furnished with full powers by the society, and the city Corporation having appointed a committee to co-operate with us, and unite in the letter of invitation, proceeded to Albany to discharge its important trust. The author of this notice having had the honor of being appointed one of the delegates, can speak from personal experience of the hospitality with which they were received, and the marked kindness and attention they experienced at the hands of the local committee. Nor was he less struck by the enthusiasm elicited by the concourse of congenial minds, there assembled—the friendships formed and cemented—the trains of experiment first suggested, or prosecuted anew after being long abandoned; above all, the awakening of the public mind to the just claims of science, as shewn by the large and crowded, and attentive audiences who frequented the rooms, and the anxiety of the press to obtain and publish detailed and lengthy reports of the proceedings. Montreal was not without a rival for the honor she coveted. Baltimore, the monumental city, had even been before her in the field, and had sent a delegate to present her claims, (Professor Steiner) whose eloquence, not less powerful than was his gentlemanly deportment and manners winning and pleasing, we were afraid, would carry the day. The permanent committee declined making the decision, and referred it to the Association at large. In the course of the discussions in the different sections some of our Montreal savans highly distinguished themselves. Sir Wm. Logan, Principal Dawson, Professor Smallwood, and Mr. Hunt contributed many valuable papers, and took prominent parts in the scientific subjects discussed, and we have no doubt this aided much in influencing the decision. Our Baltimore opponent agreed that whoever had the majority of voices should move that the decision be declared unanimous; and Montreal happily proving the favourite, Professor Steiner in most complimentary terms moved as he had proposed. The motion was agreed to amidst loud applause, and we need not say how proudly exultant was the delegation at its certainly unlooked for success.

The Local Committee held its first meeting in Montreal in

September last, and having appointed a Secretary, proceeded to add to its number some sixty of our chief citizens. These consist of some of the Judges of the land, and members of the Bar, Clergy, and members of the Medical Profession, Lieut. Col. Munro, C. B., of the 39th Regiment, some of the Editors of the Local papers, and our principal city merchants. Meetings of the Committee have been held monthly until now, the middle of July, when it has been decided to assemble weekly until the 12th of August, the day of the meeting. The general committee has been divided into five sub-committees: 1st Conveyance; 2nd. Invitation and Accommodation; 3rd. Places of meeting and access to Public Institutions, &c.; 4th Printing and Post Office; and 5th Finance. These Committees have all been hard at work making the necessary arrangements in the respective departments entrusted to them, and the diligence with which they have acted and the encouragement and assistance they have received from all quarters makes us believe that the meeting will be a most successful one, and that Montreal is fully alive to its importance.

The Government of Canada, following the example of the State authorities at Albany, have granted £500 to assist in the celebration; eleven free passages have been given by the owners of the ocean lines of steamboats; the different railroads and steamboats both here and in the United States have consented to carry the members of the Association to and from Montreal for one fare; and a subscription has been already set on foot by our citizens which promises to reach a large and liberal amount. The morning sessions of the Association, and its sectional meetings will be held in different rooms in the new Court House; the evening entertainments will be given in the Bonsecours Hall, these buildings having been placed at the disposal of the committee, gratuitously for this purpose. The meetings are all open to the public, free of charge. The Standing Committee will assemble in the Library of the Natural History Society, Little St. James Street. The Governor General, Sir Edmund Head, himself a scholar of no mean pretensions, has taken a great interest in the success of the meeting, and it is to be regretted that his absence in England, which will likely be prolonged until October, will prevent his being present personally, and taking a part in the proceedings. Invitations have been sent to eminent *savans* in Great Britain and on the European Continent, to the number, including Learned

Societies, of about 250. It is cause of much regret that the proportion of these, who have responded to the invitations and are likely to attend, is so small; but the length of the voyage, the time that it necessarily must occupy, and the very few free passages placed at the disposal of the Committee have all in some degree contributed to lessen the number. The fact of the British Association holding its meeting during the same month, and the engagement so many of the European celebrities have contracted in respect thereof, has also been a great drawback to the attendance of the foreigners invited. But we are proud to say that among those whom we have good reason to expect will be present on the occasion, are Sir R. J. Murchison, Director general of the Geological Survey of Great Britain; Col. W. J. Hamilton, M. P., ex-president of the Geological Society of London; Dr. Seaman, delegate from the Linnean Society of London; and Sir Wm. Hooker, of the Royal Botanical Gardens.

Before concluding this brief notice of an Association which we are now so actively preparing to receive, it may be well to reply to a question which some will be sure to ask, viz: how this Association differs from its fellows, and what peculiar means it has of awakening and directing to scientific purposes the power of the social spirit; or why, when there were so many old and new societies for the advancement of science, it was thought necessary and expedient to call this society into being. To say that in this respect it has but followed the example set it by the older and more celebrated institution in our father land, would, to all who understand the benefits and advantages accruing to science and the world at large from the labor of the members of that distinguished association, be explanation enough, especially when added to the fact that we live in a comparatively new country, and that in scientific investigation and research we are but beginners. But it is well to condescend a little more, and in doing so, in preference to any language of our own, we condense and apply that made use of by Sir Wm. Hamilton when answering similar queries made elsewhere.

The American Association, then, as an Association, differs in its magnitude and universality from all lesser and more local societies. What they do upon a small scale, it does upon a large; what others do for Montreal, Toronto, or New York, this does for the whole American continent. Its gigantic arms stretch even to Europe and India; and the joy with which it welcomes to its

assemblies and its hospitality those eminent strangers who come from foreign lands, rises almost above the sphere of private friendship, and partakes of the dignity of a compact between all the nations of the earth. But it is not merely in its magnitude and universality, and consequently higher power of stimulating intellect through sympathy, that this Association differs from others. It differs also from them in its constitution and details; in the migratory character of its meetings, which visit, for a week each year, place after place in succession, so as to indulge and stimulate all, without wearying or burdening any; in encouraging oral discussion, throughout its several sections, as the principal medium of making known among members the opinions, views and discoveries of each other, in calling upon eminent men to prepare reports upon the existing state of knowledge in the principal departments of science; and in publishing only abstracts or notices of all those other contributions which it has not, as a body, called for; in short, in attempting to induce men of science to work more together than they do elsewhere, to establish a system of more strict co-operation between the labourers in one common field, and thus to effect, more fully than other societies can do, the combination of intellectual exertions. The *discussions* in its sections are more animated, comprehensive and instructive, and make minds which were strangers more intimately acquainted with each other than can be supposed to be the case in any less general body; the *general meetings* bring together the cultivators of all different departments of science; and even the less formal *conversations* which take place in its halls of assembly during every pause of business, are themselves the working together of mind with mind, and not only excite but *are* co-operation.

It is this personal intercourse with the great scientific and learned men of the age, which in itself constitutes the principal charm of such meetings. How, for instance, would we have delighted to listen to a Newton, had he condescended to converse on the great truths of Astronomy; to a Jussieu, imparting to a circle of inmates in his own garden at Trianon, those glimpses with respect to the natural relations of plants, which he found it so difficult to reduce to writing; or to a Linnæus, discussing at Oxford his then novel views with respect to the vegetable kingdom, and winning from the reluctant Dillenius, a tardy acknowledgment of their merits? These great men have passed away; but we have others, in their own sphere and degree, who, when

they in turn shall have gone to that spirit world where things are seen, not as through a glass darkly, but face to face, shall in the world beneath occupy niches—if humbler ones—in the temple of fame. This

is the spur that the clear spirit doth raise
To scorn delights, and live laborious days.

And look where we will, from the highest and most solitary sage who ever desired the “propagation of his own memory,” and committed his lonely labors to the world, in full assurance that an age would come, when that memory would not willingly be let to die, down to the humblest laborer who was ever content to cooperate outwardly and subordinately with others, and hoped for nothing more than present and visible recompense, we still perceive the operation of that social spirit, that deep instinctive yearning after sympathy to use the power, and (if it may be done) guide the influences of which, this Association was framed.

We trust, then, that the Montreal meeting will not be inferior to former assemblings, but will more than realize our hopes and wishes, and not only give a new impulse to science among us, but also cement the kindly feeling which binds the members together already.

A. N. R.

NATURAL HISTORY SOCIETY OF MONTREAL.

The Annual General Meeting of this Society was held in the Museum, on Monday evening, the President, J. W. Dawson, Esq., F. G. S., in the Chair. The members present were the Lord Bishop of Montreal, Rev. A. Kemp, Rev. A. D. Campbell, Rev. A. DeSola, Dr. Fraser, Dr. Jones, Dr. Barnston, L. A. H. Latour, J. T. Dutton, H. Rose, J. H. Joseph, W. H. A. Davies, D. Robertson, J. Ferrier, jr., N. S. Whitney, R. Scott, E. Murphy, Dr. Howard, Dr. Hingston, Dr. Fenwick, B. Chamberlin, A. N. Rennie.

REPORT FOR 1857.

Your Council in submitting the annual Report of the proceedings and progress of the Society for the years 1856-7, find no difficulty in discharging this duty from lack of materials, as the subjects which have engaged their attention have been both numerous and important. Our predecessors rendered an important service to the Society, by their concise sketch of its history contained in the last report—a proceeding often necessary, in order

to mark out the progress of any public Institution, and to call the attention of its supporters to its first principles and objects. Your Council, therefore, feel that they cannot do better than take up the subject as they received it, and continue the narrative down to the present time.

The first subject which engaged the attention of the Society during the past year, was the appointment of a Committee to be its representative at the Annual Meeting of the American Association for the advancement of Science, held at Albany in the month of August last, and to solicit the selection of Montreal as the locality for the next annual assembly of that distinguished Society. A Committee was also appointed to consult with the City Corporation and with influential citizens to obtain their concurrence and assistance in accomplishing this purpose. Your Council have much pleasure in reporting that the labors of both Committees have been crowned with complete success. Your deputation was received with the utmost cordiality by the Association. Their invitation was unanimously accepted. The representatives of other cities, especially those of Baltimore, seeing the general desire of the Assembly to meet in Montreal, in the most honorable manner withdrew their claims for the time.

A large local Committee has been organised for the purpose of making the necessary arrangements for receiving and entertaining the Association, and is now actively engaged in this work. Influential private individuals have come forward to assist in various ways to facilitate and complete the arrangements necessary for this important undertaking. The Society's sister Institution in Toronto has also most honorably offered to co-operate with us in carrying the project to a successful issue. The Government and influential members of the Legislature have taken a deep interest in the matter, as likely to promote the progress of science in the Province, and have indicated their purpose to do what lies in their power to render this meeting popular and beneficial. Some of the Railroad and Ocean Steamship Companies have granted valuable assistance in the form of free passages to scientific gentlemen invited by the Local Committee from different quarters, to take part in the proceedings of the Association.

Your council anticipate from the respectability, efficiency and zeal of the Committee to which the American Association have intrusted the necessary preparations for their meeting in August next, that the result will largely contribute to the interests of this

Society, by stimulating its future efforts in the cause of science. Your Council therefore feel that it is unnecessary for them to urge upon the members of this Society the necessity of cordial unanimity and zeal in their exertions to contribute to so desirable an object. The Council entertain a confident hope that the contemplated meeting of the American Association for the Advancement of Science will be as successful as any that has yet been held.

With a view to promote the efficiency of the Society, and in compliance with the recommendation of their predecessors, Committees were last year appointed for the purpose of arranging the collection in the Museum, and of furnishing original investigations and papers in their several departments. Your Council are happy to report that, so far, this arrangement has been productive of good results; among which they would specially mention a valuable paper from the Committee appointed to report upon the method of rearing fish from the ova, the recommendations of which they trust, will be carried out as soon as practicable.

The Society at its meetings in the early part of the year having also taken into consideration the state of its building, and deeming it unsuitable for the present wants of the institution, resolved to take measures for the erection of new premises if a suitable site could be procured. A Committee was accordingly appointed to make enquiries. From the report of that Committee it was found that a sufficient sum of money to purchase an eligible site and to erect a suitable edifice could not be obtained from the sale of the present property. Enquiry was therefore made whether the grant of a free site might not be obtained. As the result of this, your Council feel great pleasure in being able to report that the Governors of the McGill College have made a very handsome offer to the Committee, of a lot of land on University and Cathcart Streets, 90 feet by 50, on terms which are equivalent to a donation, and which the Committee reported as the most eligible site that could be obtained. Your Council, under this impression, adopted the Report, and proceeded to make arrangements for the disposal of the present building, and the erection of a new one, hoping that this might be effected before the meeting of the American Association. Plans of a new building were accordingly prepared and submitted to a special Meeting of the Society. However it was found that the sum of £2000, for which the Council were authorized to dispose of the building, would not be sufficient for the purpose contemplated; it was,

therefore, determined to raise £500 in addition, by private subscriptions, amongst the members and friends of the Society. Your Council are happy to report that £250 has already been subscribed, and they entertain a lively hope that the balance will be obtained by their successors so as to complete the work they have had the honor to commence. In order to obtain sufficient means to cover all the expenses of removal, and to enable the Society to open its new erection, with their Natural History collection arranged and perfected, your Council drew up, and presented through H. H. Whitney, Esq., M. P. P., a petition to Parliament, for a more liberal annual grant to the Society. They are happy to report, that their petition has been so far successful, and that a sum of £500 has been granted by Parliament to meet the extraordinary expenses of the Society on account of the approaching convention. Your Council further expect that should the decision of her Most Gracious Majesty in Council be that Montreal shall be the seat of the Provincial Government, property will so increase in value as to enable their successors to dispose of the premises to greater advantage than could be done at present, and thus enable them more fully to realize the wishes of the Society. In connection with the new erection, the Council recommend the establishment of an Observatory if at all practicable and if sufficient means can be got to maintain it. Your Council have to regret that the revision of the Constitution and Bye laws, which have been effected at the cost of much labor, yet waits the confirmation of the Members. They are, therefore, obliged to leave so important a work, in its unfinished state, to their successors. The Society has been favored with several valuable donations during the year, for which thanks have been conveyed to the donors.

The Council have great pleasure in announcing that there has been a large increase in the number of members—*eighteen* corresponding and *thirty* ordinary members having been elected during the past year. It is with regret that they are called upon to record the loss, by removal to Toronto, of Dr. Workman. His departure from the city has deprived the Council of a painstaking treasurer and a most efficient member, and the Society of one of its oldest and firmest supporters. They beg also to note that the services of Dr. Wright, Curator for a period of three years, in arranging the Museum and the Library, are worthy of the thanks of the Society.

The title of honorary member has been conferred upon the Lord Bishop of Montreal, Sir Wm. Logan, Knt., L.L.D., F.R.S., F. G. S., Charles Smallwood, Esq., M.D., L.L.D., F.M.S., &c., &c., Professor Mitchell, of Cincinnati, Professor Hall, Albany, Professor Dunglison, Philadelphia.

The course of lectures annually delivered under the auspices of the Society commenced on the 22nd January, and were remarkably well attended by the public generally.

The Introductory Lecture was delivered by Principal Dawson.

2nd Lecture—Thursday, 29th Jan.—by E. Billings, Esq. Subject :

“The Geology of the Ottawa Region.”

3rd Lecture—Thursday, 5th Feb.—By T. S. Hunt, Esq. Subject :

“Natural History of the Alkalies.”

4th Lecture—Thursday, 12th Feb.—By Rev. A. DeSola. Subject : Scripture Zoology.”

5th Lecture—Thursday, 19th March.—By Jas. Barnston, M. D.

Subject.—“General view of Vegetable Life.”

6th Lecture—C. Dutton, Esq. Subject : “Balænus Mysticus.”

The Council feel greatly indebted to those gentlemen for their valuable services on those occasions, and congratulate the Society on the interest taken in the lectures by the public. They hope that the next Course may be on a larger scale, held in a more convenient room, and attended by a still larger number of persons.

The Council regret that from various reasons they have not been able to carry out so fully as they could have wished the recommendation of their predecessors, to obtain the reading and discussion of Monthly Essays or Papers, one paper only having been submitted; but they trust that the Meeting of the American Association and the greater facilities for acquiring a knowledge of Natural Science now enjoyed in this city, will have the good effect of calling forth greater scientific exertions in future.

The Council have much pleasure in reporting that L. A. H. Latour, Esq., 1st Vice-President, has during the year offered a Gold Medal as prize, for the best Essay in French or English on any subject of Canadian Natural History. They beg to recommend to their successors the appointment of a Committee to receive the Essays that may be offered, and to adjudge the Prize on the 1st August next. This measure, your Council trust, will call forth much latent talent, and advance the objects of the Society, while it rewards with honor the successful candidate, and realises the liberal and praiseworthy intentions of the donor.

Your Council also report that Mr. Billings, late of Ottawa, a Corresponding Member of the Society, having come to reside permanently in Montreal, has expressed a wish that the Society should take a part in the publication of "The Canadian Naturalist and Geologist," so successfully conducted by him during the past year. This offer was favorably received by the Society, and a Committee was formed to carry out this object and to open a subscription list for the issue of the second volume under the title of the "Canadian Naturalist and Geologist, and Transactions of the Natural History Society of Montreal." Another Committee was appointed to superintend its publication, of which Mr. Billings himself undertakes a part. Your Council are happy to say a first number has been printed under very auspicious circumstances, and they trust that this undertaking will meet with complete success.

Your Council have not considered it prudent at present to solicit from the Legislature a Copy Right Law, to compel publishers to contribute a copy of every publication to the several Literary and Scientific Institutions of the Province. The law as regards copyright is yet in an undecided and unsettled state, and they recommend that the matter receive the consideration of their successors.

The Council are sorry to announce that Mr. Broome, so long the Janitor of the Society, died after a brief illness a few months ago, and they have from various considerations deemed it proper for the present, to continue the services of his widow, as keeper of the premises, which they trust will meet with the approval of the Society.

The accompanying Reports of the Treasurer, Librarian and Cabinet Keeper, will present an account of the condition and prospects of the Finances, the Library, and the Museum.

In view of the meeting of the American Association in August, and of the necessity of arranging and presenting the subjects of the Museum in the best and most scientific order, the Council have engaged the services of J. M. D'Urban Esq., a young Naturalist of considerable attainments and ability, for six months as Assistant Curator. As however the collection cannot be rendered complete or properly arranged without considerable expense, which the present ordinary income of the Society will not sufficiently afford, it has been resolved to meet the additional expenditure by applying to this purpose any special funds that may be obtained.

In surrendering the important interests which have during the past year been confided to them, your Council experience much satisfaction in reviewing the activity and energy of the Society. A measure of progress has marked the history of this valuable Institution—an accession of scientific talent has been acquired, and much important literary and other labour has been undertaken. As the coming year appears destined to be one of considerable promise in promoting the aims of the Society, your Council beg to express a hope that its zeal and energy in the cause and promotion of Science may be crowned with complete success, and may largely contribute to foster that spirit of earnest investigation into the phenomena of nature which so eminently distinguishes the present age.

In conclusion, the Council have to express their gratitude for the liberal aid given by the Government in consideration of the invitation extended to the American Association. The Council recommend that a portion of this sum be expended in arranging and improving the Museum, in providing an entertainment for one of the evenings of the meeting, and that the balance be reserved for any aid that the Society may be called upon to contribute towards the success of the meeting.

A Report from the Treasurer showing a balance in hand of over ten pounds was also read; as was a Report from the Curator of the Museum, on the state of the Society's collection, and the donations made to it during the past year.

On motion of Dr. Barnston, seconded by Dr. Jones, it was resolved that the Reports now read be received and adopted, and referred to the Council for early publication.

ELECTION OF OFFICE-BEARERS.

The President having appointed Drs. Fraser and Barnston as Scrutineers, the meeting proceeded to ballot for Office Bearers and Council. The following was declared the result:—

President, J. W. Dawson; 1st Vice-President, L. A. H. Latour; 2nd Vice-President, Sir W. E. Logan; 3rd Vice-President, E. Billings; Corresponding Secretary, W. Hingston, M. D.; Recording Secretary, A. N. Rennie; Treasurer, James Ferrier, jr.

Cabinet Keeper and Librarian—Jas. Barnston, M. D.

Members of Council.—Rev. A. F. Kemp, Dr. Fraser, Rev. A. DeSola, Dr. Jones, and H. Chapman.

Library Committee.—Dr. Wright, D. A. Poe, H. Rose, N. S. Whitney.

Mr. J. M. D'Urban was appointed Assistant Curator to the Society; and the following gentlemen named as the Editing Committee of the *Canadian Naturalist*; Messrs. Dawson, Billings, Poe, Hunt, Hingston, Barnston, and Rennie.

On motion by Dr. Jones, seconded by Mr. Billings, it was resolved:—

That the thanks of the Society are hereby given to the retiring Office-bearers and Council, for their valuable and efficient services during the past year.

On motion by the Rev. A. D. Campbell, seconded by Mr. Dutton, it was resolved:—

That the best thanks of this meeting are due to H. H. Whitney, Esq., M.P.P., for his kind and valuable services in furtherance of the Society's Petition, for a supplementary grant, and that the Recording Secretary be directed to forward a copy of this resolution to the Honorable Member.

It was also moved by the Rev. A. D. Campbell, seconded by L. A. H. Latour, and resolved—That the sum of twenty-five pounds be granted to the Recording Secretary for incidental expenses, and obtaining the necessary assistance connected with the approaching Scientific Convention.

The President having left the chair, which was taken by Dr. Barnston,

The Rev. A. F. Kemp, in a highly complimentary speech, proposed a cordial vote of thanks to Prof. Dawson, for his able, efficient and zealous services during the past year. The motion was seconded by the Rev. A. DeSola, and carried by acclamation. The President briefly but appropriately acknowledged the compliment, and the meeting broke up.

A. N. RENNIE, *Rec. Sec.*

MONTHLY METEOROLOGICAL REGISTER, SAINT MARTIN'S, ISLE JESUS, CANADA EAST, (NINE MILES WEST OF MONTREAL,) FOR THE MONTH OF APRIL, 1857.

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.			Amo't of Rain in inches.	Amo't of Snow in inches.	Weather, Clouds, Remarks, &c., &c.				
	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.	
1 29.365	29.443	29.641	37.9	26.5	12.6	.199	.129	.048	.43	.80	.87	S. W. by W.	N. E. by N.	N. by E.	6.60	14.42	19.77	.....	2.14	C. Str. 10.	Snow.	C. C. Str. 6.
2 745	862	947	31	25.2	16.1	.044	.102	.076	.80	.65	.63	W.	W. N. W.	N. by E.	15.77	8.33	17.40	.....	.....	Clear.	Clear.	Clear.
3 158	056	29.896	14.4	38.0	25.6	.073	.149	.118	.68	.76	.73	S.	S. S. W.	S. E. by E.	1.75	1.81	2.35	.....	.....	Str.	4.	C. C. Str. 4.
4 738	703	864	24.9	51.0	39.2	.102	.255	.234	.65	.66	.89	S. S. E.	S. W.	S. S. W.	0.15	1.70	2.81	.....	.....	C. C. Str. 6.	4.	Lunar Halo
5 730	535	471	29.8	51.1	51.6	.138	.315	.374	.74	.81	.87	E. N. E.	S. E. by S.	S. S. E.	2.43	5.77	8.01	0.116	.....	C. C. Str. 10.	10.	Lunar Halo
6 211	224	213	56.0	48.1	31.0	.330	.312	.171	.88	.86	.89	S. S. E.	S. S. E.	N. W.	24.82	12.20	12.53	0.705	1.20	C. C. Str. 10.	10.	Rain.
7 494	696	922	21.2	32.1	25.9	.118	.160	.112	.88	.80	.70	S. W.	S. W.	S. W.	14.37	16.23	11.10	.....	1.50	C. C. Str. 4.	2.	Snow.
8 986	765	864	31.3	37.1	40.0	.153	.199	.237	.78	.83	.86	S. E. by S.	S. E. by S.	S. W.	5.31	6.73	6.62	Inapp.	.....	C. C. Str. 10.	10.	Clear.
9 880	848	518	36.4	42.1	35.0	.192	.243	.203	.83	.85	.90	S.	W. S. W.	W.	9.43	2.31	1.85	0.533	.....	Rain.	10.	8.
10 483	814	765	32.0	39.1	36.0	.183	.220	.218	.90	.89	.94	N. N. E.	N. E.	N. E.	1.33	6.63	17.43	0.103	.....	C. C. Str. 4.	6.	Rain.
11 538	534	710	33.0	44.6	37.2	.208	.211	.218	.91	.85	.91	W. N. W.	S. S. W.	S. E.	19.86	0.66	2.18	0.436	.....	C. C. Str. 10.	10.	Clear.
12 680	657	722	35.8	53.0	39.4	.210	.200	.233	.91	.73	.89	W. S. W.	S.	S. by E.	4.20	2.12	1.76	.....	.....	4.	6.	Clear.
13 785	804	799	32.1	53.5	41.6	.191	.293	.235	.94	.70	.85	S.	E. by N.	S. E. by E.	0.12	0.40	1.67	.....	.....	Clear.	2.	4.
14 642	358	29.982	32.7	36.2	37.0	.191	.229	.238	.93	.98	1.000	N. E. by E.	N. E. by E.	N. E.	3.00	20.86	20.31	3.196	.....	C. C. Str. 10.	10.	Rain.
15 29.946	25.043	29.164	33.9	42.9	33.6	.204	.225	.187	.95	.79	.90	S. W. by S.	W. S. W.	S. W.	9.07	13.66	9.11	0.850	0.40	Clear.	10.	Clear.
16 26.265	350	508	34.1	43.1	32.5	.178	.233	.182	.83	.79	.90	W. S. W.	W. S. W.	S. W.	9.72	10.61	9.77	.....	.....	4.	2.	Clear.
17 656	601	565	31.4	42.6	40.9	.171	.225	.235	.88	.79	.85	N. N. E.	N. E. by N.	N. N. W.	2.77	10.40	7.73	.....	.....	C. C. Str. 10.	10.	Clear.
18 628	710	764	39.1	42.9	38.0	.214	.252	.227	.86	.85	.92	W. S. W.	N. E. by E.	N. E. by N.	7.41	8.83	1.37	.....	.....	9.	10.	C. C. Str. 4.
19 857	721	680	40.4	55.0	42.6	.227	.342	.261	.88	.76	.89	E. N. E.	S. E.	S. E. by S.	3.47	3.41	7.27	.....	.....	Clear.	10.	C. C. Str. 4.
20 723	593	599	37.1	45.6	44.6	.190	.262	.283	.81	.81	.89	E. by S.	N. E. by N.	N. E. by N.	6.20	15.80	3.72	.....	.....	C. C. Str. 4.	4.	Clear.
21 578	583	644	38.2	46.9	38.0	.207	.284	.194	.44	.42	.80	N. E. by E.	N. E. by E.	E. N. E.	24.12	14.76	17.86	.....	.....	C. C. Str. 4.	4.	Clear.
22 610	513	566	36.4	52.3	41.5	.192	.304	.201	.83	.76	.79	N. E. by E.	N. E. by N.	N. E. by E.	10.15	9.92	5.60	.....	.....	Clear.	4.	Clear.
23 575	564	609	35.0	54.2	38.9	.186	.326	.179	.83	.75	.74	N. N. E.	N. E. by E.	S. S. E.	4.01	0.63	1.92	Inapp.	.....	C. C. Str. 6.	10.	Clear.
24 560	533	604	42.1	53.9	42.2	.242	.264	.199	.85	.61	.68	E. S. E.	W. by S.	W. S. W.	6.22	8.00	16.92	.....	.....	Str.	2.	C. C. Str. 4.
25 573	614	680	36.0	29.0	34.1	.192	.196	.162	.83	.76	.76	W. by N.	W. by N.	W. by N.	4.01	10.30	3.43	.....	.....	C. C. Str. 4.	4.	Clear.
26 683	670	700	32.3	51.4	39.6	.167	.274	.193	.83	.70	.77	W. by N.	W. by N.	S. E.	1.55	4.93	1.10	.....	.....	Clear.	4.	Clear.
27 310	350	415	32.4	34.4	32.5	.160	.178	.191	.80	.83	.95	S. E.	S. E. by S.	E. by N.	1.92	4.57	0.05	0.710	1.70	C. C. Str. 10.	10.	Rain.
28 467	395	798	34.7	38.2	32.5	.195	.207	.178	.91	.84	.86	W. by N.	W.	W.	12.26	19.55	18.12	.....	.....	9.	4.	C. C. Str. 10.
29 901	906	30.036	28.2	40.5	32.7	.135	.227	.174	.78	.75	.83	W. N. W.	N. W.	N. N. W.	9.40	12.35	6.75	.....	.....	Clear.	4.	Clear.
30 30.149	30.146	30.180	30.0	57.0	38.2	.160	.293	.177	.86	.76	.77	N. E. by E.	W. S. W.	S. E.	0.02	0.12	6.30	.....	.....	Clear.	4.	Clear.

REPORT FOR THE MONTH OF MAY, 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.		
1 30.018	29.857	29.817	40.4	58.2	51.1	.227	.290	.238	.85	.59	.61	S. E. by S.	S. by E.	S. by E.	0.00	16.02	9.25	.....	.....	C. C. Str. 4.	Cum. Str. 8.	Nimb. 10.
2 29.804	568	542	40.7	48.8	47.2	.235	.336	.349	.84	.93	.98	S. by E.	S. by E.	S.	9.22	4.50	2.90	0.543	.....	Rain.	Rain.	Cum. Str. 10.
3 784	787	854	40.1	48.0	39.8	.245	.268	.234	.85	.78	.91	W.	W. by N.	S. W.	6.82	4.60	5.30	.....	.....	C. C. Str. 9.	6.	Clear.
4 866	785	751	36.0	54.6	46.9	.220	.349	.291	.94	.81	.85	S. by E.	N. E. by E.	N. E. by E.	1.55	3.40	1.21	.....	.....	Clear.	8.	Rain.
5 600	489	548	40.9	39.3	36.1	.255	.245	.217	.94	.96	.98	N. E. by E.	N. E. by E.	N. E. by E.	21.11	31.85	21.57	1.386	.....	Rain.	Rain.	Clear.
6 595	650	692	34.5	42.2	40.5	.214	.243	.245	.99	.85	.92	N. E. by E.	N. W.	S. S. W.	5.93	0.20	0.01	0.086	.....	C. C. Str. 10.	10.	Clear.
7 717	741	847	41.1	48.5	41.2	.253	.324	.253	.91	.92	.91	S. W. by S.	S. W.	W. S. W.	0.35	3.65	2.80	0.041	.....	Rain.	2.	Clear.
8 999	907	982	38.5	60.4	50.4	.228	.350	.283	.90	.66	.75	S. W. by N.	N. W.	S. by W.	1.30	8.71	4.65	.....	.....	Clear.	4.	Clear.
9 779	612	496	47.4	30.0	62.0	.252	.481	.397	.76	.47	.71	S. by E.	S. W.	S. by E.	0.76	4.76	7.05	.....	.....	C. C. Str. 4.	4.	Str. 2.
10 524	350	593	55.0	28.5	39.0	.399	.346	.214	.89	.70	.84	S. S. W.	S. W.	N. W. by N.	6.05	9.15	10.70	0.009	.....	Cum. Str. 8.	9.	Rain.
11 840	800	914	30.1	44.0	35.0	.145	.223	.170	.78	.73	.76	N. N. E.	N. E. by N.	N. E.	24.41	4.00	2.28	.....	.....	Clear.	4.	Clear.
12 994	932	910	29.7	54.1	40.3	.152	.326	.194	.82	.76	.78	S. W. by N.	W. by S.	W. by S.	2.12	1.65	4.40	.....	.....	Clear.	6.	Clear.
13 856	801	819	39.6	59.5	46.6	.189	.267	.210	.76	.52	.64	S. W.	N. W. by W.	N.	4.00	3.97	7.81	.....	.....	Cum. Str. 6.	6.	Clear.
14 780	612	570	44.1	66.0	47.6	.223	.394	.271	.73	.61	.80	N. N. E.	N. E. by E.	S. S. E.	0.41	0.52	1.36	.....	.....	Clear.	8.	Clear.
15 506	465	510	42.0	54.6	46.7	.152	.199	.282	.53	.46	.86	N. E. by E.	N. E. by E.	S.	11.52	4.60	0.92	.....	.....	C. C. Str. 10.	10.	C. C. Str. 8.
16 563	588	670	40.1	63.6	47.0	.194	.326	.271	.73	.56	.80	N. E. by N.	E. S. E.	S. by E.	0.90	3.93	0.46	.....	.....	C. C. Str. 8.	8.	Clear.
17 696	795	899	42.2	42.4	41.6	.252	.243	.240	.85	.85	.86	S. by E.	W. by N.	S. W.	3.03	9.30	1.20	0.663	.....	Rain.	10.	Clear.
18 947	881	916	40.5	66.8	50.9	.210	.416	.285	.79	.65	.75	W. by N.	S. S. W.	W.	11.46	2.85	0.40	.....	.....	Clear.	4.	Clear.
19 026	801	842	40.3	58.0	45.0	.153	.243	.202	.57	.49	.64	E. N. E.	E. N. E.	E. N. E.	8.61	12.67	11.85	.....	.....	Clear Frost.	2.	Str. 2.
20 776	715	678	43.3	56.9	47.0	.216	.255	.252	.73	.55	.75	E. N. E.	E.	W. by S.	15.81	0.92	1.42	.....	.....	Clear.	9.	Clear.
21 599	574	570	48.1	63.4	56.8	.262	.375	.305	.80	.67	.68	S. W.	W. N. W.	W. N. W.	2.80	2.77	6.75	.....	.....	C. C. Str. 6.	6.	Clear.
22 588	564	806	50.0	78.5	65.8	.326	.473	.366	.86	.50	.63	S.	S. S. E.	S. W. by W.	0.00	1.15	2.21	.....	.....	Clear.	4.	Clear.
23 560	527	596	52.5																			