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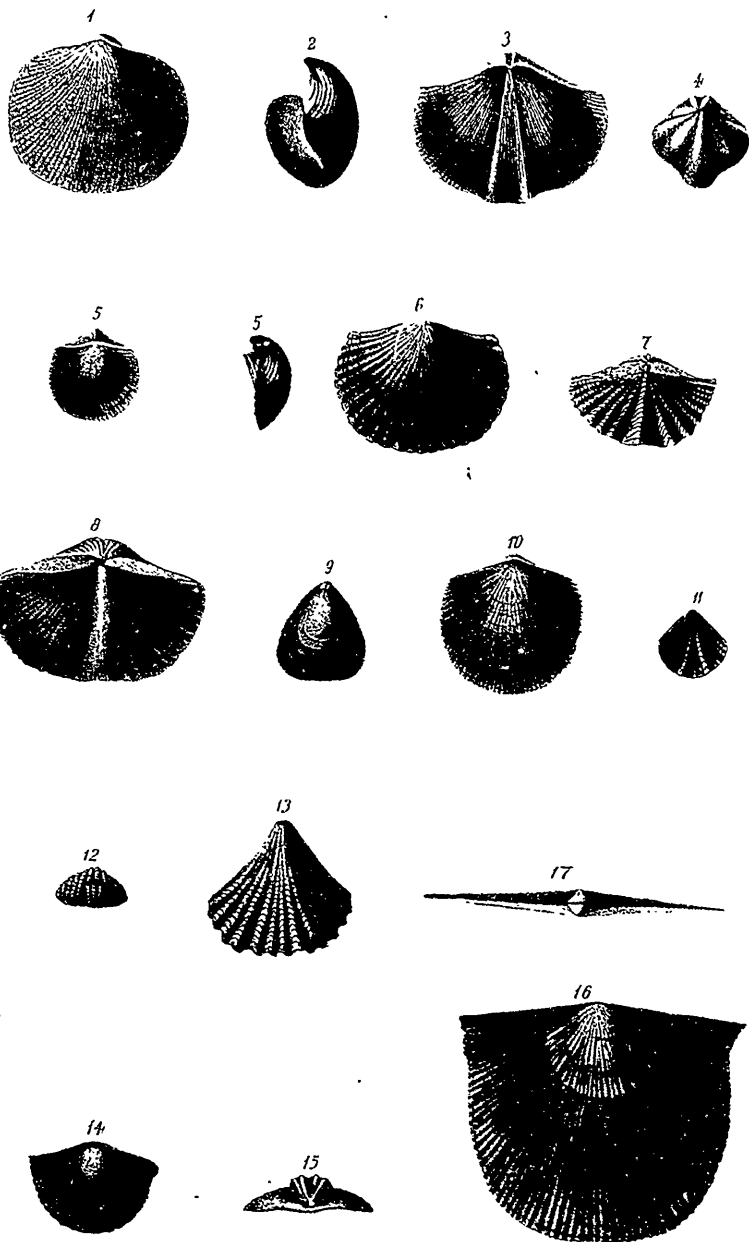
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FOSSILS OF THE NIAGARA AND CLINTON GROUPS.

J. H. Bufford Lith. Boston.

THE
CANADIAN
NATURALIST AND GEOLOGIST.

BY E. BILLINGS.

VOLUME I.

APRIL, 1856.

NUMBER II.

ARTICLE X.—*On the Wapite, or Canadian Stag, (Elaphus Canadensis.)*

GENUS ELAPHUS.

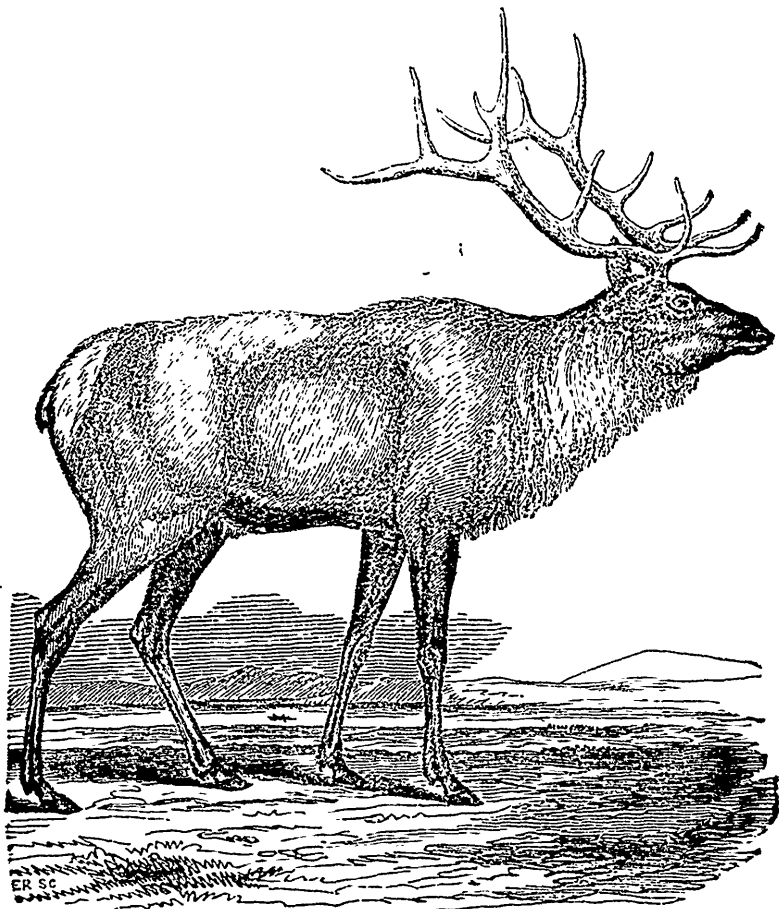
The males of this genus have large, round, branching horns, and canine teeth in the upper jaw only. The females have neither horns nor canine teeth. Both sexes have the head terminating anteriorly in a muzzle. They have also a lachrymal or sub-orbital sinus. The Dental Formula is as follows:—*Incisive*, $\frac{0}{8}$; *Canine*, $\frac{1}{1}-\frac{1}{1}$; *Molar*, $\frac{6}{6}-\frac{6}{6}$;—34. The generic name is derived from the Greek *Elaphos*, a stag. The red deer of Britain is a species of this genus. The only species known in America is the Wapite or Canadian Stag, commonly called the *American Elk*.

ELAPHUS CANADENSIS.

SPECIFIC CHARACTERS.—*Larger than the Common Deer; Horns large, not palmated, with brown antlers; a naked space round the lachrymal opening; tail short; Colour yellowish, brown above, a black mark extending from the angle of the mouth along the sides of the lower jaw; a long pale yellowish spot on the buttocks.*

According to tradition, one hundred and twenty years ago, this deer was not uncommon north of the St. Lawrence, and upon the arrival of the first white settlers its range extended over the whole of the United States. At present it is abundant in the western prairies and the eastern side of the Rocky...

Mountains, from the 56th or 57th parallel of north latitude to Texas, In the Hudson's Bay Territories, according to Sir John Richardson, its eastern limit is a line drawn from the south end of Lake Winnipeg to the Saskatchewan, in the 103rd degree of longitude, thence till it strikes the Elk River in the 111th degree. It is found rarely on the Alleghany mountains.



In Eastern Canada it is only known by the horns and scattered bones that are now and then discovered by the pioneers of the forest, while clearing up the land, and it may, therefore, so far as this section of the country is concerned, be looked upon as an extinct species.

It is a large and elegant animal, so much resembling the stag of Europe that, by the first white explorers of the continent, it was thought to be the same. Being, however, much larger and different in its colour, habits, and

other particulars, it has long since been decided by competent naturalists to be distinct. It is between four feet six inches and five feet high at the shoulders, or about one foot higher than the English stag. In Knight's Cyclopædia of Natural History, it is said that "all the upper parts and the lower jaw are of a somewhat lively, yellowish brown; there is a black mark from the angle of the mouth along the side of the lower jaw, and a brown circle around the eye. The neck is mixed with red and black, with coarse hair descending from it like a dew-lap, deeper in colour than the sides.—From the shoulders to the hips, French gray; a pale yellowish patch on the buttocks, bounded on the thighs by a black line. The tail is yellowish, and only $2\frac{1}{2}$ inches long, whereas it is nearly 7 inches in the European stag.—The hair is of a mean length on the shoulders, the back the flanks, the thighs, and the under part of the head; that on the sides and limbs is shorter, but the hair is very long on the sides of the head, posteriorly, and on the neck, particularly below where it forms the kind of dew-lap above alluded to. On the posterior and outer aspects of the hind legs, there is a brush of tawny hair which surrounds a narrow long horny substance. The ears are white within, and clothed with tufted hair externally of the same colour as the neighbouring parts; a naked triangular space round the large lachrymal sinus near the inner angle of the eye; hoofs small and black, like the common stag. The Wapite has a muzzle, upper canine teeth, and a soft tongue; the quality of the hair is brittle, and there is a short wool beneath it.*

The horns are round, very large and long. A fragment now lying before us which was found in the County of Renfrew, is two feet four inches in length and seven inches in circumference. It is a piece from the central part of a horn that was probably over four feet in length when perfect. A pair of horns from the head of a full grown Wapite weigh from thirty-five to forty-five pounds. We have just weighed a pretty large pair of buck's horns of the common species, (*Cervus Virginianus*), and find their weight to be four and a half pounds. Those of the Wapite are therefore on an average, ten times the size of those of the common buck. They are not curved forward, but rise from the head upward and backward, the main shaft being nearly on a straight line with the facial outline, or a line drawn from the point of the nose above to the forehead. Near the base they sometimes have brow antlers, or branches which bend downward. Fragments of these enormous horns are frequently found in the new Townships of Canada by the settlers, while clearing their land from the forest. They may be easily distinguished from the horns of the moose by their not being palmated, but round, with round sharp prongs; and on account of their great size, they can never be mistaken for those of the common deer. Within the last one hundred and twenty years the Wapite was somewhat common in the valley of the Ottawa, according to traditions among the Indians. The many fragments of horns we have seen, do not appear to have lain in the ground more than one hundred years. They are usually found in the vegetable soil just beneath the

* *English Cyclopædia of Natural History*, vol. 1, page 865.

layer of decomposing leaves or moss, that everywhere in the woods forms the surface. While excavating the Rideau Canal about twenty-five years since the perfect skeleton of a Wapite was exhumed at the Hogs-back, near the site of the present City of Ottawa. The horns were attached to the skull, and five feet long. Three years since the skeleton of a large deer was discovered in the County of Lanark, which was probably of this species.

The Wapite is still somewhat abundant in the Western prairies. In the paper from which our engraving of the animal is taken. Professor Baird says:—"The American Elk, sometimes called Wapite, was once extensively distributed throughout the present limits of the United States. At the present time, in the eastern parts, it is only found in a few counties of Pennsylvania—as Elk and Clearfield—where, indeed, their numbers are decreasing day by day. Occasionally one has been seen in the Moose range of the Adirondacks, in Lewis, Hamilton, and some other counties of northern New York. This has not been the case, however, for more than twenty years.—A few are known to exist in the Alleghanies of Western Virginia. We next find them in the Southern part of Michigan, but it is only as we proceed farther West, that they present themselves in numbers. In Minnesota they are found in large herds, and in still larger on the Upper Missouri, Yellowstone, and other streams. Of the vast number in these regions, some idea may be formed from the piles of shed horns which the Indians are in the habit of heaping up in the prairies. One of these, on Elk Horn prairie, about eighty miles above Fort Union, has for many years been a conspicuous land-mark to the traveller, showing like a white monument many miles off. This which was torn down in the summer of 1850 was about fifteen feet high and twenty-five in circumference; others still larger are found on the Upper Yellowstone."

In the Western prairies they congregate in herds of from twenty or thirty to six or seven hundred, and it is said that in those vast oceans of meadow the animal grows to a great size. Individuals nearly the size of a horse are not unfrequent. In California and New Mexico antlers, it is said, have been found so large that when resting on their tips a tall man could walk erect between them. Their food consists of the grass found in the woods, wild pea vines, the branches of willows, lichens, and the buds of the wild rose. During the winter they scrape the snow from the ground with the fore feet and eat the tender roots and bark of shrubs and small trees. They are fond of residing in wooded dells, islands covered with willows, or points on the river side, still clothed with forest. They make for themselves a bed upon the long grass, and occasionally upon the top of a fallen tree, where they sleep during the hot sultry hours of the day. During hot weather when mosquitoes abound in the woods, they retire to ponds or proceed to the rivers and immerse their bodies and heads, leaving merely enough of their noses above the water to allow them to breathe. A pair of them kept in confinement at New York by Mr. Audubon, were fed upon green oats, hay, Indian corn, and all such food as is usually given to a cow. Turnips they would

not touch. The pair ate as much in a day as would suffice for two horses. *

The horns fall off in February or March, and are reproduced in four or five months to their full size, and during their growth are covered with velvet like those of the common deer. The young are brought forth in May or June, one or two at a birth.

The Wapite is easily domesticated and it is often to be seen in the parks of the wealthy, both in Europe and America. As they grow old, however, the males become exceedingly pugnacious, and will sometimes in a fit of passion attack their best friends.

In their wild state, where and when they can be seen in their full size and strength, they are shy and not at all easily approached by the hunter. The herd is led by the oldest and strongest male, and wherever he goes they follow. Their senses are acute, and they easily perceive the approach of any human intruder. "The moment the air is tainted by the odour of his enemy, his head is erected with spirit, his ears rapidly thrown in every direction to catch the sounds, and his large dark glittering eye expresses the most eager attention. Soon as the approaching hunter is fairly discovered, the elk bounds along for a few paces, as if trying his strength for flight, stops, turns half round, and scans his pursuer with a steady gaze, then throwing back his lofty horns upon his neck, and projecting his taper nose forwards, he springs from the ground and advances with a velocity which soon leaves the object of his dread far out of sight. *

In the Autumn the males are subject to ungovernable passion, roaming to and fro over the plains, and fighting most desperate battles with each other. Their cry is described as a shrill whistling, quivering noise, which can be heard at a distance of one mile, and is not very unlike the braying of a jackass. It is prolonged and acute, consisting of the successive sounds *a, o, u*, uttered with such vehemence as to offend the ear. While emitting this whistle or cry, they turn their heads upwards and backwards.

Godman says, the flesh of the elk is highly esteemed by the Indians and hunters as food, and the horns while in their soft state, are also a delicacy; of their hides a great variety of articles of dress and usefulness are prepared. The solid portion or shaft of the perfect horn is wrought by the Indians into a bow, which is highly serviceable from its elasticity as well as susceptible of polish and form. The teeth are much prized by the Indians also to ornament their dresses. A "queen's" robe of antelope's skins presented to Mr. Audubon, decorated with the teeth of fifty six elks, was valued at no less than thirty horses.

When wounded, it is said this animal fights with great eagerness, apparently not only to defend himself, but also to take revenge for the injuries he may have received.

* See Audubon and Bachman's *Quadrupeds of North America*, vol. 2, pages 90 and 91.

See Professor S. F. Baird, on the "Ruminating Animals of North America," Patent Report, Washington, 1851, Part 2, Agriculture, page 116.

Godman's *American Natural History*, vol. 2, page 111.

NOMENCLATURE.—The following are the principal names under which this noble animal has been recognised by various authors:—

[(*Cerv du Canada*.) Perrault, Mem. Sur les Anim, vol. 2, p. 45; (*Cervus Major Americanus*.) Catesby Carol, App. 2, 28; (*Alces Americanus, cornibus teretibus*.) Jefferson Virginia, p. 96; (*The Stag*.) Pennant Arctic Zoology, vol. 4, p. 27; (*Wewass*.) Hearne's Journal, page 360; (*Red Deer*.) Umfreville; (*Cervus Strongyloceros*.) Schreber Saugthiere, vol. 2, page 1074; (*Wapiti*.) Warden des Etats Unis; (*Cervus Canadensis*.) Synopsis of the Species of Mammalia, Griffith's Cuvier, page 776; (*Elaphus Canadensis*.) DeKay, New York, Fauna, page 118; and also AUDUBON & BACHMAN'S Quadrupeds of North America, vol. 2, page 83.]

In Knight's Cyclopædia of Natural History, vol. 1, pages 815 and 816, there is a new classification of the Deer family. In this arrangement the genus *Elaphus* is suppressed altogether, and the Wapite is called (*Cervus Canadensis*.) the European Stag, (*Cervus elaphus*.)

The Wapite, or Canadian Stag, is commonly called the Elk in the United States and Canada, although it is a member of a very different genus. This misnomer is perhaps one of the most remarkable in Natural History, and is still practised, even by the best authors, though probably out of deference to the popular custom. In Europe no person would think of confounding the Red Deer or Stag of the British Isles with the Elk of Scandinavia. No two animals could well be more unlike each other, and yet be contained in a single family. The Elk and the Stag of Europe both belong to the family CERVIDÆ or DEER, but they differ more widely from each other than the Horse does from the Zebra, and it would scarcely be possible to convince any person that they could be the same species.

Now, in America we have two species, the exact counterparts of the two in Europe, each to each. We have the Wapite with round branching antlers, and canine teeth in the upper jaw of the male, and in all general characters closely resembling the English Stag. It is only specifically distinct, being larger, its tail shorter, and slightly differing in colour. On the other hand, we have the Moose with huge flat horns, no canine teeth in the upper jaw, and a long pendulous upper lip, the whole animal being so exactly like the Elk of Europe, that the best naturalists are yet undecided as to the propriety of separating it as a distinct species. The moose therefore is a true elk, and the Wapite is a true stag or "Deer," in the common acceptance of that word. Yet, by a strange perversion of terms, the name of the one animal has been transferred to the other, and vice versa. The "Elk" in America is called a "Deer," and the "Deer" is called an Elk.

The Wapite has been nearly, if not quite exterminated in Canada since the arrival of the Europeans, and it should therefore be regarded by the Naturalists of this Province with an especial amount of interest. We have been informed that it still exists in the western counties of the upper pro-

vince, but cannot testify from personal observation to the truth of this statement.

NOTE.—Professor Owen ranks certain remains of the English Stag among the fossils of the British Isles. He says, “the most common fossil remains of the Deer-Tribe are those which cannot be satisfactorily distinguished from the same parts of (*Cervus elaphus*.) which most abounded in the forests of England until the sixteenth century, and which still enjoys a kind of wild life, by virtue of strict protecting laws, in the mountains of Scotland.

The oldest stratum in Britain yielding evidence of a *Cervus* of the size of the Red-deer, is the red-crag at Newbourne. More conclusive evidence of the specific character of this sized Deer is afforded by antlers as well as teeth and bones, and these attest the existence of the *Cervus Elaphus* through intermediate formations, as the newer fresh water pliocene, and the mammoth silt of ossiferous caves, up to the growth of existing turbaries and peat bogs. I found remains of this round antlered Deer in all the collections of mammalian fossils from the fluvi marine crag, and more recent fresh water and lignite beds in Norfolk, Suffolk, and Essex. Similar remains have been obtained from the lacustrine deposits in Yorkshire; the head, with antlers, two feet ten inches in length, figured by Knowlton in the “Philosophical Transactions” for 1746, pl. 1, fig 2, was dug out of a bed of sand in the river Rye, in the East Riding of that country. OWEN’S BRITISH FOSSIL MAMMALS AND BIRDS, pages 472 and 473.

ARTICLE XI.—On the Common Deer, (*Cervus Virginianus*.)

(GENUS CERVUS.)

DENTAL FORMULA.

Inc's ve, $\frac{0}{8}$; *Canine*, $\frac{0}{8}-\frac{0}{8}$; *Molar*, $\frac{6}{8}-\frac{6}{8}$.—32.

Horns always present in the male, branched, sub-palmated or simple, the horns arising rounded from a burr or rose shaped base, ears large, no canine teeth, a muzzle, tail short and bushy.

The generic name is from the Latin (*Cervus*.) a deer. There are five species of the genus in North America, (see note page 61, last number,) of which only one (*Cervus Virginianus*) ranges into Canada.

CERVUS VIRGINIANUS, (Say.)

Reddish or bluish grey, according to the season, young spotted with white, horns of moderate size, curving forward, with the concave part in front, with from one to six points, occasionally palmated.

The Virginian deer is a beautiful and graceful animal still abounding in all the newer settlements of Upper Canada, and also though less numerous throughout the South-eastern and Western portions of Lower Canada. In form it is perhaps the most elegant of all the North American deer. It has a long tapering pointed head, and large lustrous bluish black eyes. The legs are slender, but well formed, and in proportion to their size, possessed of prodigious muscular strength, while the body is moderately stout and flexible. The horns are not large, but they are well armed with strong and sharp spikes. They are near their base bent backwards, and in the upper half turned forward. They are usually cylindrical, but they are also sometimes met with a good deal palmated. They vary very much in size and shape, upon

different individuals. The prongs are round, conical, sharp, and directed upwards. Situated partly on the inside of each horn near the base there is a short brow antler on most of the specimens. A large pair of horns weigh about six pounds, but there are few over four or five pounds in weight.

The colour of this animal varies with the season; in the autumn and winter it is bluish gray, in the spring reddish, becoming bluish in the summer. Beneath the chin, throat, belly, inner surface of legs, and under side of tail, white. The fawns are at first reddish brown, and spotted with white along the sides. In the autumn of their first season they lose the white spots, and thereafter are the colour of the old ones. The hair is flattened and angular, that upon the under side of the tail long and white.

The average length of this species is, from the nose to the root of the tail, 5 feet 4 inches; length of tail without the hairs, 6, or 7 inches; with the hairs, a little more than one foot.

The females bring forth in May or June, one or two, rarely three at a birth.

In Canada this deer spends the winter in the cedar and spruce swamps, where, like the Moose, it "yards," as it is called in considerable herds. The yard is simply that tract of the swamp, where a herd of the deer have taken up their quarters, and is marked by a multitude of paths through the snow in all directions. At this season their tracks are seldom seen on the hard wood lands, but in the spring as soon as the snow has thawed away they leave the swamps and thereafter during the summer and autumn they reside in the uplands, and frequent the fields during the night. In the swamps their food consists principally of the buds of the birch, cedar and spruce, with some of the mosses. In the summer they feed upon leaves, tender grasses, berries, peas, turnips, and even commit extensive robberies upon the potatoe fields. They seem to prefer peas and turnips to all other agricultural productions. They are fond of lingering all day in the neighbourhood of the fields. The buck generally makes a comfortable bed for himself in a clump of low bushes where there are plenty of soft leaves or grass, and there sleeps

NOMENCLATURE —(*Cervus*.) Latin, a deer. The Virginian or Common Deer has been variously described by authors and travellers under the names of (*Amerikanischer Hirsch*.) German, American Deer; (*Virginischer Hirsch*.) German, Virginian Deer; (*Cerf de la Louisiane*.) French, "the Stag of Louisiana," Fallow Deer and American Stag. The appellation (*Cervus Virginianus*.) Virginian Deer, is that bestowed upon it by the American Naturalist (SAY.) whose name is appended above. In the new classification of the deer given in the English Cyclopædia, this species is called (*Cariacus Virginianus*.) We shall give this new arrangement of the *Cervidae* entire at the end of the next article.

The following are the differences between the four Genera of Deer described in this work:—

1st Genus (*Cervus*) The males only have horns, and there are no canine teeth in either sex.

2nd. Genus (*Elaphus*.) The males have horns and canine teeth, the females have neither.

3rd. Genus (*Turandus*.) Both the males and the females have horns and canine teeth.

4th. Genus (*Alces*) Horns and teeth the same as in the genus (*Cervus*.) but the horns are very broadly palmated, and the whole anterior of the animal, including the head and the neck, very different in structure from any other Deer. We have met with no description of the genus (*Alces*.)

During the greater part of the day. In the latter end of May, and in the month of June, when the flies are troublesome, they come out into the fields towards the close of the day, generally about an hour before sunset.—They also frequent the water in the night at this season to protect themselves from the flies. In certain sections of the country, particularly where the Utica Slate underlies the surface, there are numerous saline springs. The deer are very partial to the water of these springs, and hence they have received the name of "Deer licks." A method of killing them in the newer settlements is much practised by the younger hunting community, as follows: In some branching tree near the "Deer Lick," a scaffold is constructed with a seat sufficient to contain one or two persons. Armed with a rifle or a smooth-barrelled gun well charged with buck-shot, or one or two bullets, the hunter towards night ascends into this nest and waits until the unsuspecting animal arrives to take his evening draught. It generally approaches cautiously, but examining only the objects on the ground in the neighbourhood of the spring. The enemy in the tree above is not noticed until the deadly report reveals him often too late. They resort to these licks in the evening, during the night and in the morning—not so frequently during the day. It is said that they content themselves with merely sipping the water and licking the saline matter from the stones. We have often observed them and seen them drink a good deal of the water. The old bucks are exceedingly wary, and not easily approached unless when intensely engaged in feeding in a pea field, or when the hunter stumbles upon one while half asleep in his lair. In the months of October, November, and December, they run furiously through the woods, following particular paths. They will often then brush close by a person without perceiving him. At this season we have seen them running swiftly along a "Deer path" with their heads low down near the ground, in the manner of a hound hunting by scent. The bucks have furious battles with each other, using both horns and feet; sometimes the horns of the combatants become so entangled that they cannot be separated—both then perish by hunger, or become the prey of other animals. The American Naturalist SAY, gives the following instance:—"As the party were descending a ridge, their attention was called to an unusual noise proceeding from a copse of low bushes, a few rods from the path. On arriving at the spot they found two buck deers, their horns fast interlocked, and both much spent with fatigue, one in particular being so much exhausted that he could not stand. Perceiving that it would be impossible that they should extricate themselves, and must either linger in their present situations, die of hunger, or be destroyed by the wolves, they despatched them with their knives, after having made an unavailing attempt to disentangle them."—Beyond doubt, many of these animals must annually thus perish.

They are fattest in autumn, but in December the bucks become lean, while the does are fat until the middle of the winter. In the spring they are very thin and feeble. A barbarous method of hunting the deer at this season, is to attack them in their "yards." A party of men with a number of dogs seek out one of those places and set their curs in pursuit.—

The terrified deer runs in all directions, following their beaten paths through the snow. The hunter stands by and fires at the animals as they pass.—These slaughters take place generally in the month of March, when the snow is deep and covered with a crust, upon which the dogs can run and the men walk easily with their snow-shoes, while the unfortunate deer with its sharp feet sinks through at every bound, wounding its legs and marking its course with blood.

The laws for the protection of deer prohibits, under a fine, the killing of them at any period between the first of February and the first of September, but it unfortunately happens that this law is seldom enforced, and in consequence great numbers of these animals are slaughtered in their yards at a time of the year when neither their skins nor their flesh is of any value.

In still hunting or stalking the deer in the woods, it is necessary to practice great caution. When the first snow falls, the hunter follows their tracks as silently as possible until he can get a shot, which is not his good fortune every day. An old buck when he knows you are on his trail, will lead you many a weary mile without favouring you with a view of his majestic person. At first the track is found, and traced perhaps several hours until the hunter is within easy rifle shot, when the breaking of a fallen branch beneath the feet is sufficient to put the animal upon his guard. He listens eagerly, and his quick eye soon catches the outline of his pursuer, and after regarding him for a moment, he sets off at a dashing speed. He runs several hundred yards, then stops, listens and watches again. The hunter approaches, but the eye of the deer is the keenest in the forest, and you may follow on the track a whole day and never get a sight of the intended victim, although he may be at no time more than one quarter of a mile in advance.

Another method of hunting the deer practised in Canada is by driving them into the lakes or rivers with hounds. When pursued by the dogs, this animal at once flies to the water, his instinct perhaps influencing him to break the scent by crossing a stream. Some of the party are stationed at those points where the deer have their favourite crossing places, and when they approach may get a shot. This method, as well as every other, is not always successful. Often the deer takes a long round through the forest and run towards some distant water, in which case there can be no sport that day, and often the dogs are led so far away that they do not return for several days, and are, in fact, occasionally lost altogether.

Hunting with a lantern is also practised. A tall cylindrical cap of birch bark, with an opening in front, is placed upon the head, a lighted candle is placed inside so that the light is immediately over the brow of the hunter, and thus whilst it attracts the deer shines along the barrel of the gun when aim is being taken. The deer sees the light, and remains gazing steadily at it, while, at the same time, his eyes appear in the dark like two coals of fire. An easy shot may be thus obtained. This method, or one similar in principle, carrying a torch instead of a lantern, and gliding along a river in a canoe at night, is also practised with much success.

The deer when suddenly started in a field, does not make off at its full

speed. The long hairs of its tail are bristled up suddenly, like those of a cat at the sight of a dog. The animal for a distance of two or three hundred yards proceeds by lofty bounds, alighting at each spring upon three of its feet, upon one side and then upon the other. This gives to the body and tail, which is held erect, and expanded into a tall white brush, a rocking motion which cannot be well understood until seen. Soon, however, the prodigious bounds subside into lengthened leaps, and the animal stretches out, lies down as it were to the work, and is soon out of sight.

On the open plains, however, a well mounted horseman or a grey hound will easily run down a deer. This method of pursuing them has been practised in the Southern States where there are large plains.

The female brings forth in May or June, and conceals her fawns in a clump of bushes, where they remain coiled up while she feeds at no great distance. They will sometimes when found where placed by the dam, lie perfectly still, and suffer themselves to be taken without attempting to escape.

The horns of the buck fall off in January or February. They sprout again in the latter end of May, and in September the velvet is rubbed off.

The flesh of this animal is excellent, and the skin is famous for its durability and pliancy. The Indians soak the hide and scrape off all the hair, then smear it with the brains of the animal which have been preserved for that purpose, and by repeatedly rubbing and pulling, reduce it to a sufficient degree of softness. It is then hung over a fire of rotten wood and smoked, a process which is said to prevent the leather from becoming hard after being wet.

The Indians in the West consume every part of the deer, even to the contents of the stomach. It is said that the half digested vegetables in the stomach of a deer are not unpalatable, even to a white man. We should, however, prefer performing the process of mastication for ourselves.

This deer is easily domesticated, but makes a troublesome pet.

GEOGRAPHICAL DISTRIBUTION.

Cervus Virginianus ranges from the Gulf of the St. Lawrence across the British provinces, and the United States to the Rocky Mountains.—West of the Rocky Mountains it is unknown, except in Mexico. We have not ascertained its existence on the north shore of the St. Lawrence, below Quebec. West of Montreal it is found throughout Upper Canada. In the tract of hilly country lying north of the Great River, Ottawa, it extends 150 miles north of that stream; and indeed some of the fur traders inform us that it is found rarely near the height of land between Canada and the Hudson's Bay Territory. In the country around Lakes Nippissing and Temiscaming, isolated bands of this deer are occasionally met with. In the County of Renfrew, on the rivers Madawaska and Bonnechere, it is at present very abundant, although twenty-five years ago it was rarely seen in that part of Canada. It ranges over the whole of the United States, being more common in some of the States than in others. It is very abundant in Texas and New Mexico. It is not found in Oregon or California, being there replaced by other species.

Messrs. AUDUBON & BACHMAN state that the specimens they "saw in Maine and at Niagara were nearly double the size of those on the hunting islands in South Carolina. The deer that reside permanently in the swamps of Carolina, are taller and longer legged than those in the higher grounds.—The deer of the mountains are larger than those on the seaboard, yet these differences the result of food or climate, will not warrant us in multiplying them into different species."

ARTICLE XII.—On the Mule Deer, (*Cervus Macrotis*.)

CERVUS MACROTIS, (Sax.)

CHARACTERS.

Horns cylindrical, twice forked; ears very long; body above, brownish grey; tail short, above, pale reddish ash colour, except at the extremity on its upper surface, where it is black; hair on the body coarse, like that of the Elk; very long glandular openings on the sides of the hind legs, (AUDUBON & BACHMAN.) Inhabits the Eastern slope of the Rocky Mountains, ranges into the Hudson's Bay Territory, North West of Lake Superior.

The only other species of the deer tribe we have ascertained satisfactorily to range into the British possessions of North America, is the Mule Deer, an animal intermediate in size between the common deer and the Canadian Stag. It is said to be a beautifully formed, graceful and powerful animal, its great ears being its only deformity. The horns are cylindrical, and twice forked. About the centre of their length they divide into two equal branches, and each of these is again divided near its extremity. Near the base of each horn there is also a small prong like that on the horn of the common deer. The curvature of the antlers is nearly the same also in these two species.

The general colour is yellowish brown; neck, sides of face, belly, and inside of legs, greyish white; there is a line of dark brown along the back from the tail to the forehead; point of tail for two inches black. The tufted gland on the inside of the leg is six inches long in this species, and the lachrymal sinus is larger than that of (*Cervus Virginianus*.)

The female of this species is larger than the large bucks of the Virginian deer, and the male still larger. It is a wild and cautious animal, which abandon a territory as soon as it becomes inhabited. Its geographical range is along the east side of the Rocky Mountains from Texas to the Saskatchewan river, in the British possessions. Very little appears to be known about its habits. It is said the female brings forth one or two in May or June. Prof. Baird, in the article to which we have so often referred, says

NOUENCLATURE—(*Cervus*) Latin, a deer; (*Macrotis*) Greek, from (*Μακρος*, long, and *Ους*, *Ους*, ear.) literally the long eared deer. The other names are *Great Eared Deer*, *Jumping Deer*, *Black Tailed Mule Deer*, and *Cerv Mulet*.

the Black Tail Deer is the largest of the true deer of the restricted genus (*Cervus*), found in North America. It derives its specific name (*Macrotis*) from the great length of the ears, resembling those of the mule, whence it is sometimes called mule deer. Its more common appellation, black tail, is owing to the black tip to the tail. In size it is considerably larger than the common Virginian deer.

"This species is limited in its range by the Missouri river, east of which it is seldom seen. In ascending this stream it is found on Vermilion river, increasing in number northwards to the Sasatchewan. In the Black Hills it is very abundant, as well as in the most of the Rocky Mountain ranges, even as far south as Texas. It is, however, confined to the eastern side of the mountains, being replaced towards the Pacific by the closely allied *Cervus Richardsonii*."

The mule deer does not extend its range into any portion of Canada, and we have no accounts of its remains having been discovered in this country. It is probable therefore that its present habitation is that assigned to the species.

The *Cervus Richardsonii* above mentioned is a smaller animal, with a black tail, very common in Oregon, and is said to range along the western coast of North America to the Russian possessions. If this be true, then it should also be included among those inhabiting the British possessions.—But until we learn more about it, we prefer not to place it in the catalogue.

NEW GENERAL CLASSIFICATION OF THE DEER.

The following is the new classification of the Deer family to which we have several times referred in the six preceding articles :—

The dental formula of the deer is, generally speaking, the same as in the giraffes, goats, antelopes, sheep, oxen, &c.; namely,

$$\begin{array}{ccc} 0 & 0-0 & 6-6 \\ \text{Incisors, -; Canines, } \frac{\quad}{\quad}; \text{ Molars, } \frac{\quad}{\quad} = 32. \\ 8 & 0-0 & 6-6 \end{array}$$

Of the molars, both in the upper and lower jaw, six are true and six false. In the upper jaw the three first molars are bordered by a thick crest on their internal surface; the three next have all the characters of the molars in the dromedaries. In the lower jaw the first incisor is the longest, the second and the third rather decrease, and the fourth is very small; all have cutting edges. The two first false molars are simple; the third has a process or heel at its posterior part, and the three others do not differ from those of the upper jaw. In the formula given above the canines are noted as absent; but this general rule is not without exception, some of the species presenting canines similar to those of Musks (*Moschus*) in the upper jaw. Muntjak has these teeth largely developed.

The Deer-Tribe possess the Lachrymal Sinus, or, as it is often termed, the Suborbital Sinus (Larmiers of the French, Tear-Pits of the English, Crumen of others.) even more universally than the Antelopes.

The late Mr. Bennett was of opinion that the use of the lachrymal

sinus, which has long remained a problem to zoologists, must be referred to sexual relations. In support of this opinion he has referred to the condition of this organ in some old Indian Deer formerly in the possession of the Zoological Society in the Gardens in Regent's Park.

Professor Owen at one time conceived it possible that the secretion of these glands, when rubbed upon projecting bodies, might serve to direct individuals of the same species to each other. He endeavoured to test the probability of this supposition by preparing a tabular view of the relations between the habits habitats of the several species of Antelopes and their suborbital, maxillary, post-auditory, and inguinal glands, in order to be able to compare the presence and degrees of development of these glands with the gregarious and other habits of the Antelope-Tribe. He has stated, however, that it was evident from this table that there is no relation between the gregarious habits of the Antelopes which frequent the plains and the presence of the suborbital and maxillary sinuses; since these, besides being altogether wanting in some of the gregarious species, are present in many of the solitary frequenters of rocky mountaineous districts. The supposition therefore that the secretion might serve, when left on shrubs or stones, to direct a straggler to the general herd, falls to the ground. ('Zool. Proc.' 1836.)

The osteological structure of the Deer-Tribe is such as would be expected when it was necessary that the bony framework should exhibit a union of lightness and strength necessary for an animal whose life is to depend on its agility and defensive powers.

The *Cervidæ* are widely spread, and seem capable of being so modified as to withstand the extremes of heat and cold.

The following arrangement of the Deer is proposed by Dr. J. E. Gray :

A. The Deer of the Snowy Regions have a very broad muzzle, entirely covered with hair. The horns are expanded and palmated; and the fawns are not spotted.

a. The Alpine Deer have no basal anterior snag to the horns, and a small bold muffle between the nostrils, as the genus *Alces*.

b. The Rangerine Deer have a large basal anterior snag to the horns close on the crown or burr, and no muffle, as *Tarandus*.

B. The Deer of the Temperate or Warmer Regions have a tapering muzzle ending in a bald muffle. The fawns, and sometimes the adults, are spotted.

c. The Elaphine Deer have a distinct anterior basal snag to the horns, the muffle broad, and separated from the lip by a hairy band; and the tuft of hair on the outside of the hind leg, above the middle of the metatarsus, as *Cervus* and *Dama*.

d. The Rusine Deer have a distinct anterior basal snag to the horns; the muffle very high, and not separate from the edge of the lips; and the tuft of hair on the outside of the hind leg, above the middle of the metatarsus, as *Rucervus*, *Panolia*, *Rusa*, *Axis*, *Hyelaphus*, and *Cervulus*.

e. The Capreoline Deer have no basal anterior snag to the horns, the

first branch being some distance above the burr ; the crumen (and pit in the skull) generally small, as *Capreolus*, *Cariacus*, *Blastocerus*, *Furcifer*, *Coassus*, and *Pudu*.

The Alcine and Rangerine Deer are confined to the northern part of both continents ; the Elaphine and Rusine Deer to the Eastern World (the latter almost exclusively to the warmer part of Asia) ; all the Capreoline Deer are peculiar to America. The only exception to these rules are—the Wapite Deer of the Elaphine group is found in Northern America, and the Roe-Buck and Ahu of the Capreoline group are found in Europe and Northern Asia.

The following is an arrangement of the genera and species of the tribe *Cervina* of Gray :—

Sub-Tribe 1. ALCEÆ.

Genus, *Alces*.

1. *A. Malchis*, the Elk.

Sub-Tribe 2. RANGERINÆ.

Genus, *Tarandus*.

2. *T. Rangifer*, the Caribou or Rein-Deer.

Sub-Tribe 3. ELAPHINÆ.

Genus, *Cervus*.

3. *C. Canadensis*, the Wapiti.
4. *C. Elaphus*, the Stag.
5. *C. Barbarus*, the Barbary Deer.
6. *C. Wallichii*, the Bara Singa.
7. *C. affinis*, the Saul-Forest Stag.
8. *C. Sika*, the Sika.

Genus, *Dama*.

9. *D. vulgaris*, the Fallow-Deer.

Sub-Tribe 4. RUSINÆ.

Genus, *Pandlia*.

10. *P. Eldii*, the Sungnai.

Genus, *Rucervus*.

11. *R. Duvaucellii*, the Bahrainga.

Genus, *Rusa*.

12. *R. Aristotelis*, the Samboo.
13. *R. Dimorphe*, the Spotted Rusa.
14. *R. Hippelaphus*, the Mijangan Banjoe.
15. *R. equinus*, the Samboe.
16. *R. Peronii*, the Smaller Rusa.
17. *R. Philippinus*, the Philippine Rusa.
18. *R. lepida*, the Sundervall Rusa.

Genus, *Axis*.

19. *A. maculata*, the Axis.
20. *A. pseudaxis*, the Spotted Axis.

Genus, *Hyelaphus*.

21. *H. porcinus*, the Lugna Para.

- Genus, *Cervulus*. . .
22. *C. vaginalis*, the Kijung.
 23. *C. moschatus*, the Kegan,
 24. *C. Revesii*, the Chinese Muntjak.
- Sub-Tribe 5. CAPREOLINÆ.
- Genus, *Capreolus*.
25. *C. Capræa*, the Roe-Buck.
 26. *C. Pygargus*, the Ahu.
- Genus, *Blastocerus*.
27. *B. paludosus*, the Guazupuco.
 28. *B. campestris*, the Mazame.
- Genus, *Frucifer*.
29. *F. Antisiensis*, the Tarush.
 30. *F. Huamel*, the Guemul.
- Genus, *Cariacus*.
31. *C. Virginianus*, the American Deer.
 32. *C. Mexicanus*, the Mexican Deer.
 33. *C. leucurus*, the White-Tailed Deer.
 34. *C. nemoralis*, the Cariacou Deer.
 35. *C. punctulatus*, the Californian Roe.
 36. *C. Lewisii*, the Black-Tailed Deer.
 37. *C. macrotis*, the Mule-Deer.
- Genus, *Coassus*.
38. *C. nemorivagus*, the Gauzu-viva.
 39. *C. rufus*, the Cuguacu-etc.
 40. *C. superciliarus*, the Eye-Browed Brocket.
 41. *C. auritus*, the Large-Eared Brocket.
- Genus, *Pudu*.
42. *P. humilis*, the Venada.

We shall conclude the articles upon the Deer of British North America with a paper read before the British Association in 1835, on the Lachrymal sinuses of these animals.

On the Infra-orbital Cavities in Deer and Antelopes, called Larmiers by the older French Naturalists. By ARTHUR JACOB, M. D., Professor of Anatomy in the Royal College of Surgeons of Ireland.

Read at the Meeting of the British Association held in Dublin, August, 1835.

In compliance with the recommendation of the Committee of the Zoological Section of the Association made at the meeting in Cambridge in 1833, I have availed myself of such opportunities as have been afforded me of investigating the nature, structure, and uses of these remarkable parts. To those altogether unacquainted with the subject it is necessary to state that they consist of two oval depressions about an inch and a half long, half an inch wide, and more than three quarters of an inch deep in the majority of instances; situated on the side of the face, and so near to the inner angle of

the eye that they create a very reasonable suspicion that they are connected with that organ, and hence the term *larmier* applied to them. The bottom of the depression is in most cases naked, but in some it is covered with the hair, consequently it is composed of the skin formed into an open sac, accommodated in a corresponding depression in the bones of the face. In many animals provided with this organ, a gutter, formed by folds of skin, leads so directly to it from the surface of the eye, that the passage of the tears from the one place to the other appears inevitable; while in others this communication is so imperfect that a doubt is at once raised as to its destination to such a purpose. If the part in question be not a cavity, as suggested by some, in which the overflowing secretions from the surface of the eye are disposed of by evaporation, another reason for its existence must be assigned. The arguments which may be urged against the supposition that it is destined to receive the tears are, first, that it exists in the antelopes and deer only, and is even absent, or merely rudimental, in many of these; while in animals said to be destitute of the usual canals for carrying off the tears to the nose, as the elephant and hippopotamus, it is absent; secondly, that the solid concretions generally found in it are not composed of such ingredients as the tears and other secretions from the surface of the eye should afford.

If the conclusion that there are cavities for the reception of tears be discarded, their identity of nature and character with the numerous provisions for the secretion of peculiar or odoriferous materials suggests itself. In many instances, especially in the mammalia, glands are found opening on the surface of the skin, and pouring out peculiar fluids, sometimes altogether unconnected with any organ; such are the glands on the side of the head between the eye and the ear of the elephant, those described by Tiedemann between the eye and nose in certain bats, consisting of a sac with a folded lining membrane, affording a foetid, oily secretion, and beneath the eye in the marmot and two-toed ant-eater; such also are the glands on the side of the chest of the shrew, described by St Hilaire, and the inguinal glands of hares. Still more remarkable examples are furnished by the pouches, affording the valuable odoriferous materials in the musk, beaver, and civet; and if additional examples be required, they are found in the otter, male hyena, ichneumon, badger, and the dorsal gland in the peccary. That the cavities alluded to in the deers and antelopes afford peculiar and often odoriferous secretions, is established on the authority of several naturalists. Buffon describes the contents in the stag as resembling ear-wax. Daubenton found the secretion in an old stag so much indurated as to constitute a solid mass, or bezoared, as he calls it, eleven lines long, seven broad, and six thick. Camper found hard, yellowish particles in the fallow deer. In a species of antelope first described by Dr. Herman Grimm, this organ secretes a fluid of such peculiar and distinct character that no doubt can be entertained of its nature. He describes it to be a yellowish, fatty, and viscous humour, having an odour between musk and camphor. Vosmaer says that it hardens and becomes black in time, and that the animal rubs it off on the rails of its cage, but he could not detect the

musky odour, Pallas, who describes the Antelope grimmea particularly, concurs in these observations.

It may be objected to the conclusion, that these are organs for the production of an odoriferous secretion, that the sac exhibits so little of glandular character that it appears inadequate for the purpose, especially when several of the external openings alluded to, as that on the head of the elephant and the back of the peccary, are merely the outlets of considerable glands; but on the other hand, many organs of this character are mere sacs, as that on the face of the bats, the bottom of which presents a peculiar folded appearance, and the cavities in the musk and beaver, which afford the odoriferous secretion in such large quantity.

A statement respecting these infra-orbital cavities has been made by the Rev. Gilbert White in his Natural History of Selbourne, which might appear to originate in some error, were it not supported by the more recent testimony of Major Hamilton Smith. These gentlemen state, that when the deer drinks, the air is forced out through these cavities, and, according to Major Hamilton Smith, may be felt by the hand, and affects the flame of a candle when held to it. Notwithstanding such a positive statement by two observers of established character for faithful description, the passage of air through these cavities cannot take place, they are perfectly impervious toward the nostril; but I have no doubt that the fact stated is correct, the air which escapes passes, not through the infra-orbital sacs, but through the lachrymal passages, which are very large, consisting of two openings capable of admitting the end of a crow's quill, the entrance to a tortuous canal, which conducts the tears to the extremity of the nose. Introducing a pipe into the outlet of the nasal duct at the extremity of the nose, I can, without difficulty, force a current of air or water through the nasal duct; and it therefore appears reasonable to admit that the effect observed by the two gentlemen alluded to, arose from the animal forcing the air into the nostrils while nose and mouth were immersed in water. Even in the human subject air may be forced up the nasal duct into the lachrymal sac, by filling the cavities of the nose from the lungs while the nostrils are closed by the hand.

Persons following up this investigation should be aware that these cavities exist in a very imperfect state in many species, being, in fact, merely rudimental, and capable of affording the secretion which they are destined to provide in others. The last traces of the organ may even be detected in goats, sheep, and perhaps all the ruminants. It is a beautiful example of that adherence to an original type or model which is so conspicuous in animal organization, and as if in obedience to a law that all the ruminants should be provided with a sinus beneath the eye for the secretion of a peculiar matter, but that it should remain in an imperfect or unfinished state in those who do not require such additional aid to distinguish sex or recognise species.

Since the above was written I have had an opportunity of examining these sinuses in the Wapiti (*Elaphus Canadensis*), and obtained from one of the cavities a large solid mass of the indurated secretion like that found in

the sinuses of the stag by Daubenton, and called by him *bezoard de cerf*.— This, Dr. Geoghegan, the Professor of Medical Jurisprudence in the Royal College of Surgeons, has been kind enough to submit to analysis, the results of which corroborate the inference that the secretion found in the cavities is derived from the cavity itself, and not from the surface of the eye. The existence of the hairs and flakes of exfoliated cuticles in layers proves that the deposit is formed from the surface beneath, and not by evaporation of fluids trickling into the cavity. Dr. Geoghegan's account of the analysis I annex in his own words.

“ The bezoard described by Dr. Jacob is covered by a fine transparent membrane, a good deal resembling goldbeater's leaf ; within this, and arranged concentrically, are four or five laminæ, having a coriaceous appearance ; these seem to be soaked with the dark brown matter which constitutes the great bulk of the mass. The thickness of these membranous coverings is altogether about a line and a half. The matter contained within this covering is of a dark reddish-brown colour, resembling indurated cerumen, and consisting apparently of a number of fine hairs matted together by a substance of an oleo-resinous appearance. This substance in one specimen was viscid and tenacious, and of the consistence of common turpentine ; while in another it was more friable. Both exhaled a most peculiar odour resembling soft soap made with fish oil, but slightly pungent and aromatic. The more friable specimen had the smell of kreosote when much diluted. The specific gravity of the large mass 1,081. The material has a slightly bitter taste, but does not dissolve in the mouth, and imparts a very slight greasy stain to paper. When heated it swells, grows darker in colour, and undergoes a partial fusion ; and if the heat be increased it takes fire, and burns with a bright flame and much smoke, leaving behind a greyish-white ash. A fragment digested with five successive portions of water, imparted to them the peculiar odour of the substance, which was, however, dissipated by evaporation. It appears therefore to contain a volatile odorous principle, which is so intimately combined with the other principles present, that even after digestion in the above mentioned number of waters, the residuum, which was but little acted on, possessed its peculiar odour nearly as strong as before. The aqueous solution afforded, on evaporation, a brownish extractive matter, with which nitrate of silver gave a copious precipitate of chloride of silver ; and oxalate of ammonia indicated a salt of lime, most probably lactate. Another portion digested in æther coloured it yellow, and the solution on evaporation furnished a yellowish-brown transparent substance, very viscid and tenacious at ordinary temperatures, very readily fusible, and exceedingly soluble in caustic potash ; immediately on uniting with them, it exhales strongly the smell of fish-oil soap. This solution is miscible with water without decomposition ; acids precipitate a white matter, and when, subsequent to the addition of acid, the mixture is heated, an oily looking matter floats, and the rest of the fluid becomes turbid and milky. Cold alcohol digested on another portion took up a good deal of yellow viscid matter ; and when evaporated furnished also some extractive, soluble in water, probably the same as that afforded by

the aqueous solutions. Boiling alcohol, digested on the residuum, takes up more of the yellow matter, which, on evaporation, affords a more resinous looking residuum, the surface of which is covered with a greasy film, also saponifiable by caustic potash. Alcohol, digested on what remained after the action of æther, dissolved only a trace of saline matter; and the residuum, after exhaustion by æther, had the appearance of thin flakes of pearly cuticle, coloured yellowish-brown, insoluble in strong acid, but soluble in potash, from which it was precipitated by acetic acid. A portion of these flakes, when strongly heated, left a white ash, consisting of carbonate and phosphate of lime, carbonate of soda, and chloride of sodium. The materials then appears to consist of a number of hairs, with a quantity of delicate, cuticular flakes the whole intimately mixed with a dark matter, composed as follows:—a brownish, viscid, oily substance, probably containing resin; a volatile odorous principle; extractive, soluble in water and alcohol; colouring matter, which adheres to the flakes of cuticle; lactates of soda and lime, a trace of phosphate of lime, and chloride of sodium in considerable quantity.”

ARTICLE XIII.—*On the American or Black Bear, (Ursus Americanus.)*

GENUS URSUS.

DENTAL FORMULA:—*Incisive*, $\frac{6}{6}$; *Canine*, $\frac{1}{1}-\frac{1}{1}$; *Molar*, $\frac{4}{4}-\frac{6}{6}$.

The bears have six incisive or front teeth in each jaw, next to which are four large and strong canine teeth or tusks, two above and two below; They have six molar or grinding teeth on each side of the upper, and seven on each side of the lower jaw. They have large heads, stout bodies and legs, and, in general, tremendous claws. They are plantigrade, or walk with the whole sole of the foot flat upon the ground. The tail is short; mammae six; two pectoral and four ventral, and the body is usually clothed with a thick coat of shaggy or partly fur-like hair. They are omnivorous, and more nocturnal than diurnal in their habits. The generic name is from the Latin *ursus*, a bear. There are four species in the British territories of North America, of which the most common is the Black or American Bear.

URSUS AMERICANUS.

SPECIFIC CHARACTERS.—*Black or brownish black; a soiled brown or yellowish patch on each side of the nose. Facial outline somewhat arched. Young with hair wavy or curled. Inhabits all the woody regions of North America, except, perhaps, the south-western part of the continent.*

NOTE.—I have the skulls and jaws of two bears killed in the Township of Huntley, about two years since. In the upper jaw of each there are five molar teeth. There is a very small molar tooth immediately behind and close to the large canine tooth, then a space of $\frac{3}{4}$ of an inch without teeth, then another small molar, next a molar about twice the size of the smaller ones, then a very large tooth, and lastly a long and narrow molar. There are six molars only in the lower jaws, and they are arranged in the same manner, the small ones in the anterior portion behind the canine teeth.

The Black Bear has very stout legs, a somewhat bulky but flexible body, a long head, slightly arched from the nose over the forehead, small eyes, and ears high, oval and rounded at the tips. The soles of the feet are short—the hairs of the feet project slightly beyond the claws, which are short, blunt, and somewhat curved. The tail is very short, and the fur is long, glossy, and soft. The general colour is black, but it sometimes varies to brown or yellowish. One was killed on the Ottawa, three years since, in 1853, which was light yellowish brown. The sides of the nose are of a fawn colour, and there is sometimes a little white on the forehead and throat. In some specimens a small spot of white above the eye. The length of the animal is from four to six feet, and large ones, when fat, in the autumn, weigh 600 pounds.

The female brings forth two cubs in the winter, and in Canada the birth takes place before the hibernating retreat is deserted.

The food of the Bear is principally vegetable, consisting of roots, grapes, berries, acorns, beech nuts, and occasionally a feast of green oats or Indian corn. In the fields of the two latter in the months of Aug. and Sept. it sometimes, in the newer settlements, commits very considerable destruction not only by the quantity eaten, but by the injury the crop sustains from being broken down and trampled in the earth. It is, however, fond of flesh, and will carry off and devour hogs, and sometimes even attack horned cattle. "It will also devour eggs, insects, and small quadrupeds and birds; but when it has abundance of its favorite vegetable food, will pass the carcass of a deer without touching it."

Although a clumsy looking animal, yet the bear can run with much swiftness, and can travel great distances through the woods without rest. DEKAY, in the Natural History of New York, gives an account of a bear which was pursued for eighteen days before it was finally killed. Although seldom seen during the chase, yet he appeared to be perfectly well aware that he was an object of pursuit, and when killed, the worn and lacerated condition of his feet testified to his exertions to effect his escape. It climbs with great facility, and when surprised in a corn field and pursued by dogs, after running a short distance it seeks for protection by ascending to the branches of a tree, where it remains until shot by the hunters. When the beech nuts and acorns are plenty, the bear climbs the trees in search of this favorite food. It then draws into its reach and breaks off large branches with its powerful fore limbs, and sometimes leaves such a collection of those broken boughs in one place in the top of the tree, that they resemble huge birds' nests. We have seen in some of the beech ridges, as they are called, twenty or thirty of those bears' nests in the trees within sight at once.

When driven to extremities the bear will stand up on his hind legs and make a desperate battle, in the manner of a boxer. One stroke of his powerful paw will disable a dog, or knock a gun or axe from the hands of the hunter. He fights with teeth, claws, and also by hugging his enemy to death. The sight and hearing of the bear are both acute, but although the animal evades the settled portions of the country and prefers the more solitary

tracts of the forest, yet it does not appear much to dread the appearance of man. When met accidentally in the woods they evince no inclination to attack, and neither do they often shew any fear. Both parties, the man and the bear, appear on such occasions satisfied to pass on without quarrelling, unless indeed the former be armed. The females are strongly attached to their young, and are dangerous to be approached while these remain under their protection.

The winter retreat in the colder regions of North America is a hollow tree, a cleft in the rocks, or any place that may afford shelter. The animal retires to his den at the first fall of the snow, and where his lair is situated on the ground, as for instance under a fallen tree, the quantity of hoar frost accumulated around the breathing hole through the snow betrays him to the hunter. When they retire in the commencement of winter they are exceedingly fat, and what is very remarkable when they first leave their dens in the spring they are also fat, but in a few days thereafter become very lean. In Godman's Natural History it is stated that "in the north the flesh of the black bear is fittest for the table about the middle of July when the berries begin to ripen, though some berries impart a very disagreeable flavour to their flesh. They remain in good condition to the following January or February. Their flesh is rendered rank and disagreeable by feeding on herring spawn, which they seek and devour with greediness whenever it is to be obtained. The Southern Indians kill great numbers of these bears at all seasons of the year, but no inducement can be offered to prevent them singeing off the hair of all that are in good condition for eating, as the flesh of the bear is as much spoiled by skinning as pork would be, the skins these people bring the traders are consequently only such as are obtained from bears that are too poor to be eaten.

"In the vicinity of Hudson's Bay the black bear has been observed to feed entirely on water insects during the month of June, when the berries are not ripe. These insects of different species are found in astonishing quantities in some of the lakes, where, being driven by gales of wind in the bays and pressed together in vast multitudes, they die and cause an intolerable stench by their putrefaction, as they lie in some places two or three feet deep. The bear swims with his mouth open and thus gathers the insects on the surface of the water; when the stomach of the animal is opened at this season it is found to be filled with them, and emits a very disagreeable stench. They are even believed to feed upon those which die and are washed ashore. The flesh of the animal is spoiled by this diet, though individuals killed at a distance from the water are agreeably flavoured at the same season of the year.

"The black bear is in fact very indiscriminate in his feeding, and though suited by nature for the almost exclusive consumption of vegetable food, yet refuses scarcely anything when pressed by hunger. He is moreover voracious as well as indiscriminate in satisfying his appetite, and frequently gorges until his stomach loaths and rejects its contents. He seeks with great assiduity for the larvæ or grub worms of various insects, and exerts a surprising

degree of strength in turning over large trunks of fallen trees, which when sufficiently decayed to admit of it, he tears to pieces in search of worms.

“During the season when the logger-head turtles land in vast multitudes from the lagoons at the south, for the purpose of laying, the black bears come in droves to feast on their eggs, which they dig out of the sand very expeditiously, and they are so attentive to their business, that the turtle has seldom left the place for a quarter of an hour before the bear arrives to feast upon her eggs.” *

The bear is frequently taken in dead falls, constructed in the manner of a martin trap. Two heavy logs are procured and placed one above the other, with stakes driven into the ground upon each side to keep them in that position. A small box-like enclosure, two or three feet square, is made upon one side, open towards the logs only, and in this the bait is placed.—The uppermost log is then raised up about two feet, and supported by a stick in such a manner that the bear in order to seize the bait must pass with his head and shoulders between the logs. The bait is also so placed and fastened to a piece of wood connected with that which supports the log above the bear, that when it is seized the log falls upon the bear's back or neck. Clumsy as this contrivance is, many bears are actually caught by it. Many of our readers have never seen a martin trap, and we have thought it proper therefore thus concisely to explain its principle as used for capturing bears.

Godman gives the following account of a bear in a dead fall :—“The animal sat upon his fore-paws facing us, the hinder paws being pressed to the ground by a heavy weight of logs, which had been arranged in such a manner as to allow the bear to creep under, and by seizing the bait he had sprung the trap and could not extricate himself, although with his fore paws he had demolished a part of the works. After viewing him for some time, a ball was fired through his head, but it did not kill him. The bear kept his position, and seemed to growl defiance. A second ball was aimed at his breast and took effect, but he did not resign the contest immediately, and was at last despatched with an axe. As soon as the bear fell, one of the Indians walked up, and addressing him by the name of *Muck-wah*, shook him by the paw with a smiling countenance, as if he had met with an old acquaintance, saying, in the Indian language, he was sorry they had been under the necessity of killing him, and hoped the offence would be forgiven, especially as the *che-mosk-o-men* (white men) had fired one of the balls. The Indians consider this bear as one of the noblest objects of the chase, and they always manifest the highest degree of exultation when they are successful in killing one. Every part of the animal is valuable to them, even to its intestines and claws; the latter are bored at the base and strung on deer's sinews, to be worn as ornaments. The flesh is considered most delicious food, and the fore paws an exquisite dainty.

“The fat of the bear is accumulated in different parts of the body to an excessive degree, towards autumn, after the animal has been plentifully

* Godman's Natural History, vol. 1, page 87.

supplied with food ; the oil obtained by liquifying it is a well known popular remedy against baldness, as well as for rubbing stiff or rheumatic joints. The fat obtained from the paws is most highly prized, either because it is difficult to procure in any quantity or because it is really finer than that procured from the body generally. It is very certain that few, or indeed perhaps none of the animal oils are finer when properly prepared than that of the bear, and hence in any case where the external application of oil is thought proper, bears oil will be preferable to any other ; but that it possesses many other virtues except those depending on its tenuity, we are not prepared to admit.

“The black bear, like all the other species of this genus, is very tenacious of life, and seldom falls unless shot through the brain or heart. An experienced hunter never advances on a bear that has fallen without first stopping to load his rifle, as the beast frequently recovers to a considerable degree, and would then be a most dangerous adversary. The best place to direct blows against the bear is his snout ; when struck elsewhere, his dense, woolly, and thick hide, and robust muscles, render manual violence almost entirely unavailing. In common with other species of bear, it endeavours to suffocate its adversary by violently hugging and compressing its chest. It is said that a man might end such a struggle in a few instants, if one hand be sufficiently at liberty to grasp the throat of the animal with the thumb and fingers, externally, just at the root of the tongue, as a slight degree of compression there will generally suffice to produce a spasm of the glottis that will soon suffocate it beyond the power of offering resistance or doing injury.”

The black bear has been found all over North America wherever there are forests, except, perhaps, in California. There is a yellow bear in the Southern States which appears to be considered the same species.

ARTICLE XIV.—*On the Grizzly Bear, (Ursus Ferox.)*

URSUS FEROX.

SPECIFIC CHARACTERS.—*Larger than the Black Bear ; soles of feet and claws longer, and ears shorter than those of the Black Bear ; colour, dark brown, with the tips of the hair paler or white ; facial outline nearly straight. Inhabits the western side of North America, from the south-east corner of the continent to 61° of north latitude.*

(*Ferox*) Latin, fierce or ferocious, This animal has also been called, by various authors, “The Grizzly Bear,” “White or Brown-grey Bear,” “Grey Bear,” “*Ursus Horribilis*,” “*Ursus candescens*,” and “*Ursus cinereus*.”

The Grizzly Bear is described as resembling the Norwegian variety of the Brown Bear of Europe. The facial line from the nose to the forehead is nearly straight, or not arched, like the corresponding feature of the

Black Bear. The head is short and round, the nose bare; ears small; legs stout, and body large. The tail is very short, the feet large, and the claws very long, while those of the Black Bear are short. Eight hundred pounds is said to be the weight of an average specimen. The length of the fore-foot of a Grizzly Bear, killed in the Rocky Mountains, exceeded 9 inches, that of the hind foot $11\frac{3}{4}$ inches, and the breadth 7 inches. In one individual the claws of the fore feet measured 6 inches in length. The colour is variable, generally dark brown, tipped with white. The strength of the animal is amazing. It is said that he drags the carcass of a buffalo, weighing one thousand pounds, with ease across the prairie. Its activity is also very great, although it cannot climb trees like the black bear. Their food consists of wild fruits, roots and flesh. They sometimes seize upon wounded animals, such as deer or buffaloes, and having eaten part, bury the rest for future use. The following accounts of this animal are given by various authors:—

“This bear, justly considered as the most dreadful and dangerous of North American quadrupeds, is the despotic and sanguinary monarch of the wilds over which he ranges. Gigantic in size and terrific in aspect, he unites to a ferociously blood-thirsty disposition a surpassing strength of limb, which gives him undisputed supremacy over every other quadruped tenant of the wilderness, and causes man himself to tremble at his approach, though possessed of defensive weapons unknown to any but the human race. To the Indians the very name of the Grizzly Bear is dreadful, and the killing of one is esteemed equal to a great victory:—the white hunters are almost always willing to avoid an encounter with so powerful an adversary, and seldom or never wantonly provoke his anger.

“This formidable bear unhesitatingly pursues and attacks men or animals, when excited by hunger, or passion, and slaughters indiscriminately every creature whose speed or artifice is not sufficient to place them beyond his reach. The Bison, whose size and imposing appearance might seem to be a sufficient protection, does not always elude his grasp, as the grizzly bear is strong enough to overpower this animal, and drag its carcass to a convenient place to be deposited and devoured at leisure.

“However singular it may appear that an animal endowed with such a fondness for destruction and blood, can exist altogether on vegetable food, it is a fact that the grizzly bear, no less than all other species belonging to the same genus, is capable of subsisting exclusively on roots and fruits: this may be inferred from the peculiarities of their system of dentition. It is by no means surprising that hunters and travellers should suppose the grizzly bear to be almost wholly carnivorous, seeing that he displays such an unappeasable ferocity of disposition, and so uniform an eagerness to destroy the life of any animal that falls within his power.

“This bear at present inhabits the country adjacent to the eastern side of the Rocky Mountains, where it frequents the plains, or resides in the copses of wood which skirt along the margin of water courses. There is some reason to believe that the grizzly bear once inhabited the Atlantic regions of

the United States, if we may be allowed to form any inference from traditions existing among the Delaware Indians, relative to the Big Naked Bear which formerly existed on the banks of the Hudson, The venerable HECKE-WELDER informs us that Indian mothers used to frighten their children into quietness by speaking to them of this animal.

“Two cubs of the grizzly bear were sometime since kept alive in the menagery of PEALE’s (now the Philadelphia) Museum. When first received they were quite small, but speedily gave indications of that ferocity for which this species is so remarkable. As they increased in size they became exceedingly dangerous, seizing and tearing to pieces every animal they could lay hold of, and expressing extreme eagerness to get at those accidentally brought within sight of their cage, by grasping the iron bars with their paws and shaking them violently, to the great terror of spectators, who felt insecure while witnessing such displays of their strength. In one instance an unfortunate monkey was walking over the top of the cage, when the end of the chain which hung from his waist dropped through, within reach of the bears; they immediately seized it, dragged the screaming animal through the narrow aperture, tore him limb from limb, and devoured his mangled carcass almost instantaneously. At another time a small monkey thrust his arm through an opening in the bear’s cage to reach after some object; one of them immediately seized him, and, with a sudden jerk, tore the whole arm and shoulder blade from the body, and devoured it before any one could interfere. They were still cubs, and very little more than half grown, when their ferocity became so alarming as to excite continual apprehension lest they should escape, and they were killed in order to prevent such an event.

“The grizzly bear is remarkably tenacious of life, and on many occasions numerous rifle-balls have been fired into the body of an individual without much apparent injury. Instances are related by the travellers who have explored the countries in the vicinity of the Rocky Mountains, of from ten to fourteen balls having been discharged into the body of one of these bears before it expired. In confirmation of these statements we shall here introduce some sketches from narratives given in the journals of Lewis and Clark, and Long’s Expedition to the Rock Mountains.

“One evening the men in the hindmost of one of Lewis and Clark’s canoes perceived one of these bears lying in the open ground about three hundred paces from the river, and six of them, who were all good hunters, went to attack him. Concealing themselves by a small eminence, they were able to approach within forty paces unperceived; four of the hunters now fired, and each lodged a ball in his body, two of which passed directly through his lungs. The bear sprang up and ran furiously with open mouth upon them; two of the hunters, who had reserved their fire, gave him two additional wounds, and one breaking his shoulder-blade, somewhat retarded his motions. Before they could again load their guns, he came so close on them, that they were obliged to run towards the river, and before they had gained it the bear had almost overtaken them. Two men jumped into the canoe; and the other four separated, and concealing themselves among the willows, fired as fast as

they could load their pieces. Several times the bear was struck, but each shot seemed only to direct his fury towards the hunter; at last he pursued them so closely that they threw their guns and pouches, and jumped from a perpendicular bank, twenty-five feet high, into the river. The bear sprang after them, and was very near the hindmost man, when one of the hunters on the shore shot him through the head and finally killed him. When they dragged him on shore, they found that eight balls had passed through his body in different directions.

“On another occasion the same enterprising travellers met with the largest bear of this species they had ever seen; when they fired he did not attempt to attack, but fled with a tremendous roar, and such was his tenacity of life, that although five balls had passed through the lungs, and five other wounds were inflicted, he swam more than half across the river to a sand bar, and survived more than twenty minutes. This individual weighed five or six hundred pounds at least, and measured eight feet seven inches and a-half from the nose to the extremity of the hind feet, five feet ten inches and a-half round the breast, three feet eleven inches round the middle of the fore-leg, and his claws were four inches and three-eighths long.

“In fact the chance of killing the grizzly bear by a single shot is very small, unless the ball penetrates the brain, or passes through the heart. This is very difficult to effect, since the form of the skull, and the strong muscles on the side of the head, protect the brain against every injury except a very truly aimed shot, and the thick coat of hair, the strong muscles and ribs, make it nearly as difficult to lodge a ball fairly in the heart.

“Governor CLINTON, in the notes to his discourse delivered before the Literary and Philosophical Society of New York, says, “that Dixon, an Indian trader, told a friend of his, that this animal had been seen *fourteen feet long*; that notwithstanding its ferocity, it had been occasionally domesticated, and that an Indian belonging to a tribe on the head waters of the Mississippi, had one in a reclaimed state, which he sportively directed to go into a canoe belonging to another tribe of Indians, then returning from a visit: the bear obeyed, and was struck by an Indian. Being considered as one of the family, this was deemed an insult, resented accordingly, and produced a war between these nations.”

“Mr. JOHN DOUGHERTY, a very experienced and respectable hunter, who accompanied Major LONG's party during their expedition to the Rocky Mountains, several times very narrowly escaped from the grizzly bear.—Once, while hunting with another person on one of the upper tributaries of the Missouri, he heard the report of his companion's rifle, and when he looked round beheld him at a short distance endeavouring to escape from one of these bears, which he had wounded as it was coming towards him. Dougherty, forgetful of every thing but the preservation of his friend, hastened to call off the attention of the bear, and arrived in rifle-shot distance just in time to effect his generous purpose. He discharged his ball at the animal, and was obliged in his turn to fly; his friend, relieved from immediate danger, prepared for another attack by charging his rifle, with which he again

wounded the bear, and saved Mr. D. from further peril. Neither received any injury from this encounter, in which the bear was at length killed.

“On one occasion several hunters were chased by a grizzly bear, who rapidly gained upon them. A boy of the party, who could not run so fast as his companions, perceiving the bear very near him, fell with his face towards the ground. The bear reared up on his hind-feet, stood for a moment, and then bounded over him in pursuit of the more distant fugitives.

“Mr. DOUGHERTY, the hunter before mentioned, relates the following instance of the great muscular strength of the grizzly bear:—Having killed a bison, and left the carcass for the purpose of procuring assistance to skin and cut it up, he was very much surprised on his return to find that it had been dragged off, whole, to a considerable distance, by a grizzly bear, and was then placed in a pit, which the animal had dug with his claws for its reception.

“This bear strikes a very violent blow with his fore-paws, and the claws inflict dreadful wounds. One of the cubs before mentioned as belonging to the Philadelphia Museum, struck the other a blow over part of its back and shoulder, which produced a large wound like a sabre cut. It is stated in Long’s Expedition, that a hunter received a blow from the fore-paw of a grizzly bear, which destroyed his eye and crushed his cheek bone.

“The grizzly bear is unable to climb trees like other bears; he is much more intimidated by the voice than the aspect of man, and on some occasions, when advancing to attack an individual, he has turned and retired merely in consequence of the screams extorted by fear. The degree of ferocity exhibited by the grizzly bear appears to be considerably influenced by the plenty or scarcity of food in the region it inhabits.

“The following are the dimensions of the specimen preserved in the Philadelphia Museum, as given by SAY:—

Length from the tip of the nose to the origin of the tail,	5 ft. 2 in.
The tail, exclusive of the hair at the tip,	1¾
From the anterior base of the ear to the tip of the nose,	6
Orbit of the eye,	¾
Between the eyes,	6⅔
Ears from their superior base,	3
Longest claw of the fore-foot,	4½
Shortest,	2¾
Longest claw of the hind-foot,	3
Shortest,	1¾
Hair at the tip of the tail,	4½
Length of the hair on the top of the head,	1¾ to 2
Beneath the ears,	2½ to 3½
On the neck above,	3
On the shoulders above,	4½
On the throat,	4
On the belly and behind the fore legs the longest hairs are	6

“These measurements are taken from two individuals which were by no

means full grown, as may be perceived by comparing them with the measurements heretofore cited from Lewis and Clark. They will serve, however, to give a fairer idea of the proportions of this animal than any which have been previously given, as they are so much more detailed and very carefully made."

ARTICLE XV.—*On the White or Polar Bear (Ursus maritimus.)*

URSUS MARITIMUS.

SPECIFIC CHARACTERS.—*Head long and straight upon the facial outline. Skull flat; body and neck long, in proportion to the height; hair long, soft and white; larger than any other species of the genus; length, from 8 to 9 feet; height, 4 to 5 feet; weight, over 1000 lbs. Inhabits the northern regions of Europe, Asia, and America.*

The habits of this celebrated bear are such as to confine it, as its name indicates, constantly to the shores of the ocean. Being a powerful swimmer, and capable of enduring the most intense cold, its life is spent among the dreary ice-bergs in the Polar Seas, perhaps with as much enjoyment as those animals can experience whose organization adapts and limits them to the mild climate of the south. Notwithstanding its residence in the most inhospitable regions of the earth, in consequence of the many exploring and whaling expeditions that have been carried into the domain of the Polar Bear, his habits are as well known as those of any other species.

The food of this animal consists of the carcasses of whales, thrown on shore by the waves, dead fish, seals, land animals, birds, eggs, and berries. He is said to pursue young whales in the water and capture them. When he discovers a seal lying on the edge of the ice, he swims to the leeward of him and approaches by short dives, so arranging his distances that at the last dive he emerges from the water directly before his victim. Should the seal attempt to escape by rolling off the ice into the water, he falls into the jaws of his enemy, and should he lie still or attempt to move upon the ice, the bear, with a powerful spring, seizes and devours him.

It is said that the females only of this species sleep during the winter: "The males leave the land in the winter time and go out on the ice to the edge of the open water, in search of seals, whilst the females, burrow in deep snow drifts, from the end of December to the end of March, remaining without food and bringing forth their young during that period; that when they leave their dens in March their young, which are generally two in number, are not larger than rabbits, and make a foot mark in the snow no bigger than a crown piece." According to another statement, the cubs, when they leave the den, are as large as a shepherd's dog, and this appears the most probable. The cubs, when tired in the water, ascend the back of the dam, who swims easily, carrying her young in this position.

"This animal swims excellently, and advances at a rate of three miles an hour. During the summer season he principally resides in the ice-islands, and leaves one to visit another, however great be the distance. If interrupted while in the water, he dives and changes his course; but he neither dives very often, nor does he remain under water for a long time. Captain Ross saw a polar bear swimming midway in Melville Sound, where the shores were full forty miles apart, and no ice was in sight large enough for him to have rested on."

They have been seen on ice-islands two hundred miles distant from land, and sometimes they are drifted to the shores of Iceland, or Norway, where they are so ravenous as to destroy all the animals they find. Most commonly such invaders are soon destroyed, as the natives collect in large numbers and commence an immediate pursuit, but frequently do not succeed in killing them before many of their flocks are thinned. An individual polar bear has occasionally been carried on the ice as far south as Newfoundland, but this circumstance very rarely occurs.

Generally the polar bear retreats from man; but when pursued and attacked he always resents the aggression, and turns furiously on his enemy. When struck at with a lance, he is very apt to seize and bite the staff in two, or wrest it from the hands. Should a ball be fired at him, without taking effect in the head or heart, his rage is increased, and he seeks revenge with augmented fury. It has been remarked that, when wounded and able to make his escape, he applies snow to the wound, as if aware that cold would check the flow of blood.

A great majority of the fatal accidents following engagements with the polar bear, have resulted from imprudently attacking the animal on the ice. SCORESBY, in his interesting narrative of a voyage to Greenland, relates an instance of this kind. "A few years ago, when one of the Davis's Strait whalers was closely beset among the ice at the 'south west,' or on the coast of Labrador, a bear that had been for some time seen near the ship, at length became so bold as to approach alongside, probably tempted by the offal of the provisions thrown overboard by the cook. At this time the people were all at dinner, no one being required to keep the deck in the then immovable condition of the ship. A hardy fellow who first looked out, perceiving the bear so near, imprudently jumped upon the ice, armed only with a hand-spike, with a view, it is supposed, of gaining all the honour of the exploit of securing so fierce a visitor by himself. But the bear, regardless of such weapons, and sharpened probably by hunger, disarmed his antagonist, and seizing him by the back with his powerful jaws, carried him off with such celerity, that on his dismayed comrades rising from their meal and looking abroad, he was so far beyond their reach as to defy their pursuit."

In the morse or walrus this bear has an enemy of great power and fierceness, with which he has at times dreadful combats, most generally terminating in the defeat of the bear, as the walrus is armed with long tusks, capable of giving deadly wounds. The whale is also a perpetual enemy of the polar bear, chasing him from the waters it frequents, and killing him by

blows with its tail. Notwithstanding, the bear succeeds in catching and feasting on many of the young whales.

The dwelling-place of the polar bear on shore is by no means well ascertained, but is most probably in caves, or some well concealed situation ; it has been stated that they reside, during winter, in excavations made in the permanent ice ; but Fabricius, from personal observation, declares the statement to be incorrect. Certainly this animal does not go to any great distance from the sea, on which he is almost exclusively dependent for food. Hence the flesh of the polar bear is generally fishy and rank, though it is said to be whitish, and similar to mutton. Captain Cook's people always preferred it to the flesh of the walrus or morse, yet they never considered it a very desirable food, except when none other was to be obtained. The fat resembles tallow, becoming as clear as whale-oil after liquefaction, and free from disagreeable smell ; the oil obtained from the feet has been used medicinally, but except in fineness, has no qualities which the oil of other parts does not possess.

One of the most singular facts relative to the polar bear is, that its liver is to a great degree poisonous, a circumstance unknown in almost every other animal. Three of Barent's sailors were very much injured by eating of it ; and Capt. Ross, in his late Arctic voyage, verified the observation by experiment. The principle which imparts this noxious quality to the liver is as yet undiscovered ; we know of no article of diet used by the animal, to which it can be attributed, and even if we did, this would not account for the deleteriousness of the liver, while all other parts of the body remain free from any injurious property.

The skin of the polar bear, dressed with the hair on, forms very substantial mats for carriages, or hall floors. The Greenlanders sometimes take it off without ripping up, and inverting the skin, form a very warm sack, which serves the purposes of a bed, the persons getting into it in order to sleep comfortably. It cannot well be dressed at any other than the winter season, on account of its great greasiness when freshly removed from the animal.—The nations residing in the vicinity of Hudson's Bay dress it in the following manner : they first stretch it out on a smooth patch of snow, and stake it down, where it soon becomes stiffly frozen. While in this condition the women scrape off all the fat till they come to the very root of the hair. It is occasionally permitted to remain in that situation for a considerable time, and when taken up it is suspended in the open air. When the frost is very intense, it dries most perfectly ; with a little more scraping it becomes entirely dry and supple, both skin and hair being beautifully white. Notwithstanding that this bear is so large and powerful, his skin is both light and spongy.

The female polar bear is as rugged in her appearance, and as savagely ferocious in disposition, as her mate ; yet to her offspring she displays a tenderness of affection which strongly contrasts with her fierce and sanguinary temper. When her cubs are exposed, danger has no existence to her, and nothing but death can compel her to desist from struggling desperately to

defend or save them. The death of her offspring is with great difficulty acknowledged by the parent ; when they are shot by her side the poor beast solicits their attention by every fond artifice, and endeavours to awaken them from their unnatural sleep : she offers them food, licks their wounds, caresses and moans over them in such a manner as to evince a degree of feeling which could scarcely be anticipated from so rude and terrible a quadruped.

Numerous instances of this fondness of attachment have been observed, and some of them attended with most singular displays of sagacity on the part of the mother. The following circumstance is related in Scoresby's account of the Arctic Regions, and is entitled to the fullest credence, because coming from so competent and excellent an observer :—

“ A she bear, with her two cubs, were pursued on the ice by some of the men, and were so closely approached, as to alarm the mother for the safety of her offspring. Finding that they could not advance with the desired speed, she used various artifices to urge them forward, but without success. Determined to save them, if possible, she ran to one of the cubs, placed her nose under it, and threw it forward as far as possible ; then going to the other, she performed the same action, and repeated it frequently, until she had thus conveyed them to a considerable distance. The young bears seemed perfectly conscious of their mother's intention, for as soon as they recovered their feet, after being thrown forward, they immediately ran on in the proper direction, and when the mother came up to renew the effort, the little rogues uniformly placed themselves across her path, that they might receive the full advantage of the force exerted for their safety.”

The most affecting instance on record of the maternal affection exhibited by this bear, is related in one of the Polar Voyages ; it conveys so excellent an idea of this creature's strong feeling of parental love, that we should deem the history of the animal imperfect, were such an illustration omitted :

“ Early in the morning the man at the mast-head gave notice that three bears were making their way very fast over the ice, and directing their course towards the ship. They had probably been invited by the blubber of a sea-horse, which the men had set on fire, and which was burning on the ice at the time of their approach. They proved to be a she bear and her two cubs ; but the cubs were nearly as large as the dam. They ran eagerly to the fire, and drew out from the flames part of the flesh of the sea-horse, which remained unconsumed, and ate it voraciously. The crew from the ship threw great pieces of the flesh, which they had still left, upon the ice, which the old bear carried away singly, laid every piece before her cubs, and dividing them, gave each a share, reserving but a small portion to herself. As she was carrying away the last piece, they levelled their muskets at the cubs, and shot them both dead ; and in her retreat they wounded the dam, but not mortally.

“ It would have drawn tears of pity from any but unfeeling minds, to have marked the affectionate concern manifested by this poor beast in the last moment of her expiring young. Though she was sorely wounded, and could but just crawl to the place where they lay, she carried the lump of

flesh she had fetched away, as she had done the others before, tore it in pieces, and laid it down before them; and when she saw they refused to eat, she laid her paws first upon one, and then upon the other, and endeavoured to raise them up. All this while it was piteous to hear her moan. When she found she could not stir them, she went off, and when at some distance, looked back and moaned; and that not availing to entice them away, she returned, and smelling around them, began to lick their wounds. She went off a second time, as before; and having crawled a few paces looked again behind her, and for some time stood moaning. But still her cubs not rising to follow her, she returned to them again, and with signs of inexpressible fondness, went round first one and then the other, pawing them, and moaning. Finding at last that they were cold and lifeless, she raised her head towards the ship, and growled her resentment at the murderers, which they returned with a volley of musket balls. She fell between her cubs and died licking their wounds."

How long the female of this species goes with young has not been ascertained, but it appears quite certain that she brings forth during the winter season in her den.

In its geographical distribution, this animal ranges, in America, from Labrador along the eastern and northern coasts of America to the mouth of Mackenzie's River. Thence westward, they appear to be unknown on this continent. In the old world, it inhabits the Frozen Ocean, the coasts of Siberia, and the Islands of Nova Zembla and Spitzbergen.

The following measurements of the Polar Bear are given by Capt. LYON, in the excellent and interesting narrative of his Arctic Voyage in company with Capt. PARRY:—

Length—From the snout to the insertion of the tail, 8 ft. 7½ in.—the head only 1 ft. 6 in.—from the eye to the ear, 10 in.—from the nose to the centre of the eye, 8 in.—of the ear alone, 4½ in.—the tail from root to tip, 5 in.—fore-claws, 5½ in.—hinder claws, 1½ in.—canine teeth, 2½ in.

Girth—Round the body, 7 ft. 11 in.—neck, 3 ft. 4½ in.—fore-leg, 2 ft. 3 in.—hind-leg, 3 ft. 3 in.—round the snout, 1 ft. 9½ in.—round the forehead, 2 ft. 1 in.

Breadth—Paws, 10 in.—between the ears, 1 ft. 3 in.—canine teeth, 3 in.—

[*Weight*, 1600 lbs.]

Capt. LYON, in consequence of having seen a Polar Bear prowling about during the coldest part of the year, infers that Naturalists are mistaken in thinking that this animal becomes torpid during winter. We do not feel authorised to draw a similar conclusion from Capt. L.'s observation; especially as the habits of the *genus* in this respect are well known, and because the usual food of the polar bear must be extremely difficult to obtain, if it be at all accessible to the animal, during the severest part of the winter.—*Godman's Natural History*.

ARTICLE XVI.—On the Cinnamon Bear (*Ursus cinnamomum*.)

URSUS CINNAMOMUM.

SPECIFIC CHARACTERS.—Form and size of the common American Black Bear, of which it is a permanent variety. Colour: above, dark cinnamon brown, nose and a fringe of hair covering the claws, yellow. Inhabits the fur countries west and north of the Missouri, extending to the Barren Grounds of the north-west.—AUDUBON & BACHMAN.

The Cinnamon Bear is of the same size and form as the black bear, but all the individuals being of a different colour, and the hair being somewhat longer and finer, it has been thought proper to classify it as a distinct species, or rather as a permanent variety. The traders procure many of the skins each year, and they are much more valuable than those of the black bear, on account of the length and fineness of the fur. There is a bear described by Sir John Richardson, (*Ursus Arctos*) which appears to be the same as the present species. Sir John calls it the "Barren Ground Bear," it being found in that part of the Hudson's Bay Territory called the Barren Grounds. Its habits appear to be the same as those of the black bear. Several years since a bear was killed near the Chatts, on the River Ottawa, of a light reddish brown, which may have been of this species. In 1804, an expedition, under the direction of two adventurous explorers, Messrs. Lewis and Clark, was despatched from the States across the Rocky Mountains, to Oregon, and in the narrative of the journey the following account is given of this animal:—

"Two men visited the Indian village, where they purchased a dressed bear skin, of a uniform pale reddish brown colour, which the Indians called *yackah* in contradistinction to *hohhost*, or the white bear. This remark induced us to inquire more particularly into their opinions as to the several species of bears; and we therefore produced all the skins of that animal which we had killed at this place, and also one very nearly white, which we had purchased. The natives immediately classed the white, the deep, and the pale grizzly red, the grizzly dark brown, in short, all those with the extremities of the hair of a white or frosty colour, without regard to the colour of the ground of the soil, under the name of *hohhost*. They assured us, that they were all of the same species with the white bear; that they associated together, had longer nails than the others, and never climbed trees. On the other hand, the black skins, those which were black, with a number of entire white hairs intermixed, or with a white breast, the uniform bay, the brown, and light reddish brown, were ranged

under the class *yackah*, and were said to resemble each other in being smaller, and having shorter nails than the white bear, in climbing trees, and being so little vicious that they could be pursued with safety. This distinction of the Indians seems to be well founded, and we are inclined to believe, first, that the white or grizzly bear of this neighbourhood form a distinct species, which, moreover is the same with those of the same colour on the upper part of the Missouri, where the other species are not found; second, that the black and reddish brown, &c., is a second species, equally distinct from the white bear of this country, as from the black bear of the Atlantic and Pacific oceans, which two latter seem to form only one species. The common black bears are indeed unknown in this country; for the bear of which we are speaking, though in most respects similar, differs from it in having much finer, thicker, and longer hair, with a greater proportion of fur mixed with it, and also in having a variety of colours, while the common black bear has no intermixture or change of colour, but is of a uniform black.*

The four species of bears described in the preceding articles are the only ones known in North America, and they all range into the British territories. Messrs. Audubon and Bachman state:—"The Cinnamon Bear, so far as we have been able to ascertain, is never found near the sea coast, nor ever west of the Ohio valley, until you approach the Rocky Mountain chain, and it is apparently quite a northern animal."

ARTICLE XVII.—*On the Fossil Corals of the Lower Silurian Rocks of Canada.*

The corals of the Silurian rocks are among the most abundant of fossils; and on account of the important part the animals of which they are the remains have performed, in effecting extensive changes on the surface of the earth in various geological epochs, are particularly worthy of attention. Most persons have some idea of the existence of coral reefs, or great ridges of rock, some of them several hundreds of miles in length, formed of coral, in the oceans of the present day; but not all are aware that these reefs are found upon the dry land also, and extend even into Canada. Speaking of the Onondaga and corniferous limestones, Sir Charles Lyell says:—"Although in New York they have seldom a united thickness of more than 50 feet, they are observed to constitute an almost continuous coral reef over an area of not less than 500,000 square miles, from the State of New York to the Mississippi, and between Lakes Huron and Michigan, in the north, and the Ohio River and Tennessee in the south. In the western States they are represented by the upper part of what is called the "cliff limestone." There is a grand display of this calcareous formation at the

* Lewis and Clark's Travels, vol. 2, page 33.

falls or rapids of the Ohio River at Louisville, in Kentucky, *where it much resembles a modern coral reef.* A wide extent of surface is exposed in a series of horizontal ledges, at all seasons when the water is not high; and the softer parts of the stone having decomposed and wasted away, the harder corals stand out in relief, their erect stems sending out branches precisely as when they were living. Among other species I observed large masses, not less than five feet in diameter of *Favosites Gothlandica*, with its beautiful honey-comb structure, well displayed, and by the side of it, the *Favistella* combining a similar honey-combed form with the star of the *Astræa*. There was also the cup-shaped *Cyathophyllum*, and the delicate net-work of the *Fenestella*, and that elegant and well known European species of fossil called the "chain coral," *Catenipora escharoides*, with a profusion of others.—These coralline forms were mingled with the joints, stems, and occasionally the heads of lily encrinites. Although hundreds of fine specimens have been detached from these rocks to enrich the museums of Europe and America; another crop is constantly working its way out under the action of the stream, and of the sun and rain in the warm season when the channel is laid dry."

This corniferous limestone, "the coral reef," of which Sir Charles speaks, leaves the State of New York near Buffalo, and crosses into Canada where it constitutes, as we have stated in our first article, * nearly all the stratified rock that can be seen in the counties of Norfolk, Oxford, Perth, Elgin, Middlesex, Kent, Essex, and portions of several other counties adjoining these. It cannot, of course, be seen everywhere upon the surface, being for the greater part concealed beneath the drift formation, or those deposits of clay, sand, and gravel, which constitute the loose soil of the country; and again in some places where it can be seen, it is not composed altogether of coral, while in other localities the corals being liberated by the decomposition of the rock literally cover the ground.

In order to convey an idea of the nature of these fossil corals, we think it proper to make in this place a few observations concerning the organization of the humble, but interesting, and often most beautiful little animals, which in modern seas form the reefs by their accumulated remains. In the world of life there is a vast difference between the lowest and the highest of animated creatures, but geology shews us that the former have in all ages affected more in transforming the surface of the earth than the latter. The physiological structure of the coral animal consists of little else than a digestive cavity or stomach and a mouth leading into it, yet this simple apparatus has the power of withdrawing from the ocean the various elements held in its waters, and of converting them into rock. Myriads of these creatures swarming together, cover the sides of submarine mountains with one unbroken sheet of life and by constantly absorbing from the water the component parts of coral rock, and converting it into stone, they cause the ground, as it were, to grow beneath them. Every year a fresh layer is added to every portion of the space occupied by them, and their subaqueous mountain grows higher and higher until it reaches the surface, and becomes a coral island.

* See page 22 of the first number.

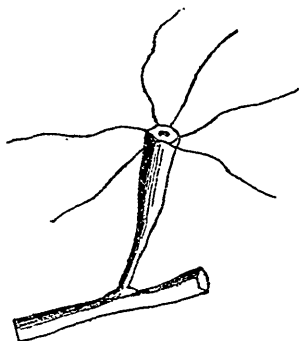


Fig. 1, *Ideal figure of a Hydra.*

The animal is simply an empty sack, with a mouth. Into this mouth is drawn by the tentacula, various microscopic animalculæ, which happen unluckily to venture within their reach. Once within, they are soon digested into a liquid which is absorbed into the walls of the sack, and contribute to the nourishment and growth of the Hydra. The young seem to grow of their own accord out of the sides of the parent. They "appear at first as knob-like protuberances from the body of the Hydra, they gradually increase in size and come to present something of the form of the parent; an aperture is then seen at the free extremity, and around this, tentacula begin to sprout. The young during their growth are like so many buds upon the sides of the original stock, and the hollow part of each communicates with the internal cavity of the old one, from which they are fed. Even after the tentacula of the bud are sufficiently developed to enable it to obtain food for itself, the communication remains open for a time, as appears from the fact that either of the stomachs is distended when the other is fed. As the bud, however, advances towards completeness, the aperture contracts, and is at last obliterated; the stock itself gradually becomes more slender, and is at last broken by the slightest effort of either the old or the young Hydra, and the latter is then set free, and after roaming through the water for a time attaches itself to a twig or stone and commences life and the rearing of a family on its own account. There is no distinction of sexes, and what is more astonishing, the Hydra may be cut into pieces and each minute fragment will grow into a new and perfect Hydra, and produce young. †

The Hydra is not a true coral animal, and has no hard parts. The reef building animals are marine, and a little more complicated in structure. If we were to imagine a small additional sack hanging down inside of the

* *Polyp*, plural, *Polypi*. The general designation of coral animals, from the Greek, (*polus*,) many, and (*pous*,) foot; the many tentacles of the Polyp being at first considered the feet.

† See Dr. Carpenter's Principles of Comparative Physiology, HYDRA, in index.

In Fig. 1 is seen an ideal representation of a Hydra, a minute fresh water animal remotely related to the coral building, *Polypi*. * It consists simply of a slender tube-like sack attached at one end to some solid object in the water, such as a stone, twig, or floating piece of wood, and having at the other extremity a small opening surrounded with several thread-like tentacula. These parts constitute the whole animal. There are no viscera of any kind, heart, lungs, blood vessels, or nerves within.—

Hydra from the mouth, we should have an approximate idea of the structure of what is improperly called the coral insect. The bodies of most of these consist of two sacks, one within the other, the mouth communicating only with the smaller or inner sack. The space within, all round between the two sacks, is divided by a number of upright partitions which extend from without inwards. As in the Hydra, there are no viscera. The food is captured by the tentacula, and drawn into the stomach through the mouth passing first into the inner sack where it is digested. The undigested portions are then thrown out through the mouth, but the liquid extracted from the food is discharged through an aperture at the bottom of the inner sack and flows into the space between the two, whence it is absorbed into the general structure of the animal, as in the Hydra.

The above explains the leading features of the structure of those Polypi, whose secretions form large areas of submarine rock in many of the warmer regions of the ocean. Those who wish to pursue the subject farther, and we strongly recommend all who feel any interest in the wondrous works of the Creator to do so, must consult other books where these matters are treated of more in detail.

The Hydra, and a multitude of the other Polypi, are entirely soft, and do not form coral; but in great many other genera, within the substance of the outer wall or sack, and also of the radiating partitions, various stony elements are secreted, and an internal hard skeleton is formed. As the animal is attached to the rock, so is its skeleton, and as when one generation dies another grows upon its remains, so the reef must grow until it reaches the surface of the water, and thus those obstructions to the navigation so common in many of the seas are produced.

The corals grow upon the bottom of the ocean in a great variety of forms. Some of them spread over the rock in an incrusting layer, consisting of myriads of the Polypi, connected together and forming a continuous thin sheet over the bottom everywhere alive with their minute flower-like forms. Others sprout upward in the shape of shrubs or small trees, with stout round branches, each formed of thousands of the Polypi: while some species form little rounded hillocks, like the dome of a Turkish Mosque, and in size from two or three inches to twenty feet in diameter. The Polyyps spread over these with their circles of tentacula, appear like so many individual flowers, and they are moreover so radiant with colours, that, according to the descriptions of travellers, no scene upon earth is more beautiful than one of those submarine gardens. *

* Among them, says Professor DANA, are flowers of all hues and sizes. The Actinæ may be well called the Asters, Carnations, and Anemonies of the submarine garden; the Tubipores and Alcyonia, form literally its pink beds; the Gorgoniæ and Melitææ, are its flowering twigs; the Madreporæ, its plants and shrubbery; and Astræas often form domes amid the grove, a dozen feet or more in diameter, embellished with green or purple blossoms which stud the surface like gems; while other hemispheres of Meandrina appear as if enveloped in a net-work of flowering vines.

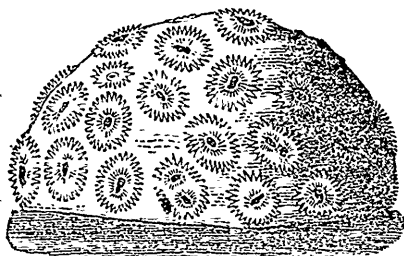


Fig. 2, *Astraea purpurea*, (DANA.)

Figure 2 will give an idea upon a small scale of a dome-shaped coral. This figure is copied from Silliman's American Journal of Science, New Series, vol. 3, page 3. In that volume of the Journal there are several fine articles on Corals, written by Professor James Dana, who spent several years among the Coral Islands of the

Pacific and other seas, and whose magnificent work upon the ZOOPLYTES* is considered to be one of the best contributions ever made to any department of Natural History. Mr. Dana says in one of the articles in question:—"Many of the various shapes which these zoophytes assume, are familiarly known. Madreporic shrubs and trees, and the sea-fan and other Gorgoniae from the West and East Indies, are common in collections.—The hemispheres of *brain-coral* (*Meandrina*,) and also of *star-coral* (*Astraea*,) are often met with. It is very generally supposed that these are by far the most frequent, if not the only shapes presented; but, on the contrary, the varieties are extremely numerous, as we have already intimated. Some species grow up in the form of large leaves rolled around one another like an open cabbage, and *cabbage-coral* would be no inapt designation for such species. Another foliated kind consists of leaves more crisped and of more delicate texture, irregularly clustered;—*lettuce-coral* would be a significant name. Each leaf has a surface covered with polyp-flowers, and was formed by the growth and secretion of these polyps. Clustered leaves of the acanthus and oak, are at once called to mind by other species; a sprouting asparagus-bed by others. The mushroom is here imitated in very many of its fantastic shapes, and other fungi, with mosses and lichens, add to the variety.

"Vases of Madreporics are common about the reefs of the Pacific.—They stand on a cylindrical base, which is enveloped in flowers when alive, and consist of a network of branches and branchlets, spreading gracefully from a centre, covered above with crowded sprigs of tinted polyps. The vases in the collections of the Expedition, at Washington, will bear out this description, although but the lifeless coral.

"The domes of *Astraeas* are of perfect symmetry, and often grow to a diameter of ten or twelve feet without a blemish. The ruder hillocks of *Porites* are sometimes twenty feet across. Besides these, we might describe columns, Hercules' clubs, and various strange shapes which are like nothing but themselves.

"It is an enquiry of much interest, how these various forms proceed from the budding process.

* *Zoophyte*, from the Greek, (*Zoon*,) an animal, and (*Phyton*,) a plant.—The word is used with various limitations of meaning by different authors, but seems to be synonymous with *Polyp*.

"Buds grow from some part of the parent, generally appearing first as a small protuberance upon its side, and afterwards perfecting into a complete young animal with its mouth and tentacles. Each of the compound zoophytes above alluded to, commenced with a single polyp and was thus formed; bud followed bud, and so the germ grew up into the coral tree or dome. Calculating the number of polyps that are united in a single *Astræa* dome, twelve feet in diameter, each covering a square half inch,—we find it exceeding one hundred thousand; and in a *Porites*, of the same dimensions, in which the animals are under a line in breadth, the number exceeds five and a half millions; there are here, consequently, five and a half millions of mouths and stomachs to a single zoophyte, contributing together to the growth of the mass, by eating, and growing, and budding, and connected with one another by their lateral tissues and an imperfect cellular or lacunal communication. There is hence every variety, as to number, among compound zoophytes, down to the simple polyp, which never buds at all, and has, for its corallum, a simple calicle,—it may be a tiny goblet, with a stellate cell, as in the *Cyathina*—a cylindrical cup, as in some *Dendrophyllias*—or a radiated disk, as in the *Fungias* and *Cyclolites*."

After treating of the various modes of growth which result in the production of trees, vases, domes, or incrusting sheets of coral, he says: "There is much to surprise and interest us in tracing out the simple causes of results so remarkable. The small polyp, incapable even of extending its arms without a drop of water to inject them, is enabled, by means of a simple secretion in its texture, in connexion with the process of budding, to rise from the rock and spread wide its branches, or erect, with solid masonry, the coral domes, in defiance of the waves that break over them. The microscopic germ of a *Gorgonia* develops a polyp barely visible to the naked eye, which has the power of producing a secretion from its base. The polyp buds, and finally the growing shrub is covered with branches and branchlets, many a mere thread in thickness, which stand and wave unhurt in the agitated waters. The same secretions fix it to its support, so strongly, that even the rock comes away before the zoophyte will break from its attachment. Tens of thousands of polyps cover the branches, like so many flowers, spreading their tinted petals in the genial sunshine, and quiet seas, but withdrawing when the clouds betoken a storm.

"*Excelsior*," is the grave motto of the zoophyte. Ever upward, they continue growing and elongating, although death is at work below, with as rapid progress. A beautiful provision protects the branching coral-tree—often the work of ages—from being destroyed by the dissolving waters, when exposed, on the death and removal of the polyps. Certain minute incrusting corals—the *Bryozoa* and *Sertularidæ*, together with *Nullipores*—make the surface their resting place, as soon as it is laid bare, and go on spreading and covering the dead trunk, and so prevent the wearing action of the sea. The *Madrepore* may thus continue to enlarge beyond its adult size; the *Caryophyllia* may multiply almost endlessly its cylindrical branchings, although the living animal but tips the extremities of each: for protection is given at once, when needed, and the polyps die, only to leave the surface to other forms of life, more varied and no less strange.

“ Finally, the coral becomes subservient to a still higher purpose than the support of polyps and nullipores. The debris, produced by the waves over a reef, settles into the many crevices among the dead trunks, and fills up the intervals, often large, between the scattered coral-patches; and, by this combined action of living growth and detritus accumulations, a solid rocky basement is formed, and kept in constant increase. In this way the coral reef gradually nears the surface, and finally becomes the foundation of one of the fairest of

“ The sea-girt isles,
That, like to rich and various gems, inlay
The unadorned bosom of the deep ;”

the coral polyps now yield place to the flowers and groves of the land, which fulfil their end in promoting the comfort and happiness of man.”

After the above somewhat extended remarks and quotations, we shall now proceed to examine some of the fossil corals that may be collected more or less abundantly from those rocks in Canada which in remote ages were reefs at the bottom of the ocean, probably as brilliant in their floral hues as those of the Pacific. The first of these we shall mention belongs to the family of the *Cyathophyllinæ* * or cup shaped corals, and is somewhat common in certain localities of the Trenton Limestone.

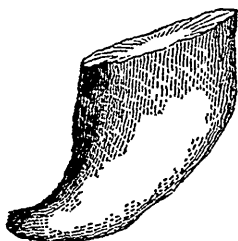


Fig. 3.



Fig. 4.

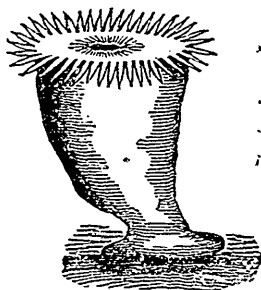


Fig. 5.

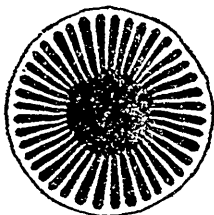


Fig. 6.

Figs. 3 and 4.—*Streptelasma corniculum*, as it is usually seen in the fossil state in the Trenton Limestone.

Fig. 5.—An ideal figure of a living streptelasma.

Fig. 6.—A section across one of those fossils near the top.

In the figure given of the dome-shaped *Astræa*, (Fig. 1, page 119,) it will be seen that the specimen from which the drawing was made, consisted of a number of Polypi growing together in one mass, but in the species now

* From the Greek “*Kuathos*,” a cup.

under consideration, each individual grew separately and unconnected with any other. Fig. 5 shews what we suppose was the appearance presented by one of these Polypi when growing on the bottom of the ocean. Outside, it probably consisted of a soft fleshy covering, which attached itself by a spreading base to the bottom. This soft integument also spread over the top and was perforated in the centre by a small opening, which was the mouth.—Around this was the circle of tentacles; from the mouth there hung down into the interior a small sack, which was the stomach; between this and the exterior there were a number of thin partitions radiating in the manner shewn in Fig. 6. These partitions and the inner portions of the exterior envelope or sack became solidified during the life of the animal, in the same manner that the bones of a quadruped are formed within the exterior soft covering of flesh. All those corals which are to be seen in the cabinets of the curious, were, when alive, covered with a thin gelatinous layer of fleshy substance. After death this decays, and only the solid part, or the coral, properly so called remains, preserving the shape of a branching twig, a dome shaped mass, or a cup, according to the species. The corals of this extinct genus *Streptelasma* are of the latter form, and partly hollow within, though usually found filled with limestone. Good empty specimens shew the radiating partitions projecting inward and meeting in the centre at the bottom of the cavity. The partitions or lamellæ, as they are called, extend up and down, and are more numerous above than below.

With the above explanations it will perhaps not be difficult for the student of Canadian Geology to understand the following concise description of the genus. It will be recollected that a family of animals, or fossils, contains a number of genera, and each genus, one or more species.

GENUS STREPTELASMA, (HALL.)

GENERIC CHARACTERS.—Corallum, simple, turbinate; radiating lamellæ, meeting in the centre at the bottom of the cup, where they are more or less twisted; no transverse diaphragms.

The generic name is from the Greek (*Streptos*), twisted; and (*plasma*), lamellæ; corallum means simply "coral;" turbinate, is top-shaped or conical. This genus is also called (*Petraia*) by many European Geologists, from the Greek (*Petraion*), stony, or living among stones.

There are several species of this genus (*Streptelasma*) in the Trenton and other limestones of Canada. They usually have the appearance of short curved petrified horns of some ruminating animal. They are striated upon the outside from the top to the bottom, each of the striæ marking the position of one of the lamellæ inside of the cup. The following are the species that most frequently occur in Canada :—

STREPTELASMA CORNICULUM, (Hall.)

This species is generally from an inch to one inch and three quarters in length, considerably curved and marked by several obscure wrinkles or folds, between which again are many finer ones that encircle the cup. These are only visible in perfect specimens. Those which are worn on the outside do not shew them. In the specimens in our collection which we believe to

belong to this species, there are from 60 to 90 lamellæ to be seen on the outside of the cup at the margin. In those which are empty the cavity once occupied by the inner sack mentioned in the preceding pages, extends downward from one fourth to one third of the length of the fossil. On the outside the lamellæ are seen to branch from the sides of a line running from the top to the bottom along the convex, curved side, and again from two other similar lines at the sides.

This species occurs in the Trenton Limestone, and is somewhat common in the rock at the Barrack Hill at the city of Ottawa. The specific name (*corniculum*) is from the Latin, "a little horn."

STREPTELASMA PROFUNDA, (Hall.)

In this species the cup is very little, or not at all curved. The length is about an inch and a half in full grown specimens, and the cavity within extends sometimes nearly to the bottom, hence the name (*profunda*), "profound" or "deep." There are about 74 lamellæ in specimens of the size represented in Fig. 7. They are usually small, and large alternately. The small ones are those newly developed, and not full grown.

This species occurs in the Black River and Bird's Eye Limestones, at the base of the Trenton.

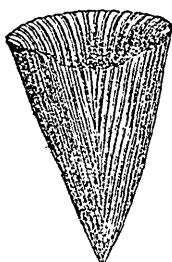
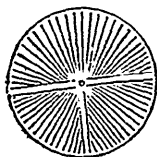


Fig. 7.—*Streptelasma profunda*.

In addition to the above there are several other species in the Trenton Limestone which we shall endeavour to figure hereafter. They are *S. crassa* with about 50 thick coarse lamellæ, *S. multilamellosa* with about 120 lamellæ, and *S. parvula* with only about 30. The latter is very small, and all resemble very much *S. corniculum*. *Crassa*, thick; *multilamellosa*, "many lamellæ;" and *parvula*, small.

The mode of growth of these corals appears to have been as follows:—At first they consisted of a mere point attached to the rock, when the cup commenced to form there were only four partitions or lamellæ, as it increased others were added, three of the original ones continuing to grow, and the fourth being undeveloped. In good empty specimens of *S. profunda* the three large primary lamellæ are very conspicuous above the others on the inside of the cup, and on the outside their position is marked by three upright seams extending from the top to the bottom, and from each side of which the newer lamellæ may be seen branching away. One of those is seen in the front of Figure 7.



These cup shaped corals with the four primary lamellæ commenced their existence in the seas of the Lower Silurian age, but became extinct in the Permian. To this important fact we shall return hereafter.

Fig. 8.—Interior of (*S. profunda*), shewing the three large primary lamellæ.

GENUS COLUMNARIA, (Goldfuss.)

A very abundant family of fossil corals have a honey-combed structure, consisting of a great number of angular tubes growing together, each tube being the cup or cell of a single polyp. The *Astræa* shown in figure 2 is one of those composite forms, and when dead is covered with numerous star-like openings. The rays of the stars in each of those tubes of the *Astræa* correspond to the lamellæ of the genus *Streptelasma*. If we could imagine a number of these latter crowded together in one mass, they would constitute a star covered dome, something like the *Astræa*. In the Lower Silurian rocks one of the most common of the honey-combed corals is the *columnaria alveolata*. The following is a description of the genus compiled from several authors.

GENERIC CHARACTERS.—Corallum forming large masses, often of a hemispheric form, cells, polygonal, radiating lamellæ, rudimentary, or but little developed; transverse, diaphragms, horizontal, and numerous.

The generic name is from the Latin, (*Columna*), a column having allusion to the numerous column-shaped tubes of which the masses of the coral are composed. The transverse diaphragms are the little plates or floors which extend across the tubes, dividing each into so many stories, one above the other. There is one species of this genus known in Canada, and it is very common in some localities of the Black River Limestone. It is the following:

COLUMNARIA ALVEOLATA, (Goldfuss.)

This species is thus described by Professor Hall:—"A hemispherical or irregularly massive coral, consisting of radiating parallel or diverging tubes; tubes hexagonal, (or varying from 5 to 7 sided,) striated longitudinally, crossed by dissepiments, (diaphragms,) with vertical radiating lamellæ; no communicating pores.



Fig. 9.

Fig. 9.—Is a small mass of (*Columnaria alveolata*), shewing the honey-combed appearance of the exterior of the fossil.



Fig. 10.

Fig. 10.—Shews the portion of the surface of a mass which has been split open in the direction of the length of the tubes. Each tube is seen to be divided into a number of chambers by the transverse diaphragms.

When the tubes of this coral are well preserved and empty, the interior is seen to be striated the whole length of the tube, the elevated lines being the rudiments of radiating lamellæ. The coral is sometimes seen in masses three feet in diameter, and when these are split open in a direction from the top to the bottom, the tubes are seen to radiate from a narrow space in the

centre at the base, curving gracefully outwards. Each one of the tubes was the residence, or rather the hard external skeleton of a single Polyp, and when these were alive, no doubt the whole surface of the mass was covered with animal flowers, as in the *Astræa*. The seas of the ancient Silurian epoch were perhaps quite as gorgeous as the coral reefs in the southern climes of the present day.

Columnaria alveolata is confined to the Black River Limestone which lies just below the Trenton Limestone. Fine specimens may be collected in the quarry, where materials are now being procured for the Chatts Canal on the Ottawa.

The *Favosites Niagarensis* mentioned in Article 6, pages 57 and 60, of this journal, and also *Favosites Gothlandica*, noticed in the quotation from Sir Charles Lyell, at the commencement of the present article, very much resemble this species externally. The difference is in the internal structure, the walls of the tubes of *Favosites* being perforated by numerous small circular pores, and *Columnaria* unperforated. *Alveolata* appears to have been derived from the Latin, (*Alveare*,) a bee-hive, or (*Alveolus*,) the holes in which teeth are placed.

Another genus of corals composed of tubes most prolific in the Lower Silurian rocks of Canada, is *Chaetetes*. Some of the strata in the Trenton Limestone appear to be composed almost altogether of one species of it in a fragmentary state. The tubes are exceedingly small, and they differ from *Astræa* and *Columnaria* in presenting no traces of radiating lamellæ. The following is a description of the genus:—

GENUS CHÆTETES, (Fischer.)

GENERIC CHARACTERS.—Corallum usually forming cylindrical branches or hemispheric, or irregular masses composed of numerous long slender polygonal tubes with transverse diaphragms, but no pores or radiating partitions.

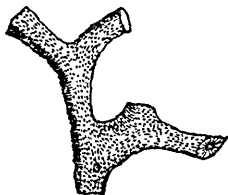


Fig. 11.

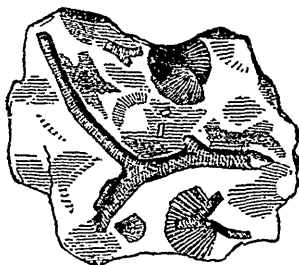


Fig. 12.



Fig. 13.

Figs. 11, 12, and 13.—Different forms of *Chaetetes Lycoperdon*.

The above figures shew the most common forms of this coral. Fig. 13

is the branched variety. It is often seen on the surfaces of the strata of limestone, partly imbedded in the rock, and resembling small broken twigs of trees. Often layers of shale are met with between the strata, packed full of these short stems. They are from one-fourth to one-half of an inch in diameter. The tubes are exceedingly slender and hair-like, seldom exceeding one-fortieth of an inch in diameter. They are so small that it requires close examination of the surface of the coral to detect their presence. In the branched variety they originate in the centre of the stem, and radiate outward and upward. When such specimens are split open, this internal arrangement of the tubes can be well seen. The other variety is usually seen in small hemispheric or button-shaped masses from half an inch to three inches in diameter. Often they are globular, with a rounded concavity in the bottom. Sometimes they are found with a projection below, giving them the appearance of the stopper of a bottle, with a wide mushroom-shaped top. They also occur nearly flat, or with the upper surface no more convex than an ordinary watch glass. The base of those flat specimens is wrinkled concentrically. These masses are formed of the same long slender tubes as those which constitute the branched variety.

More than one hundred years ago, when geology was unknown, a Swedish traveller, PETER KALM, a Professor in the University of Abo, in Swedish Finland, visited Canada, and in his narrative, gives the following account of the Fossils he saw in the Limestone at Fort St. Frederic, or Crown Point, on Lake Champlain :—

“The mountains on which Fort St. Frederic is built, as likewise those on which the above kinds of stones are found, consisted generally of a deep black limestone, lying in lamellæ as slates do, and it might be called a kind of slates, which can be turned into quicklime by fire. This limestone is quite black in the inside, and, when broken, appears to be of an exceeding fine texture. There are some grains of a dark spar scattered in it, which, together with some other inequalities, form veins in it. The strata which lie uppermost in the mountains consist of a grey limestone, which is seemingly no more than a variety of the preceding. The black limestone is constantly found filled with petrifications of all kinds, and chiefly the following :

“*Pectinites*, or petrified *Ostræa Pectines*. These petrified shells were more abundant than any others that have been found here, and sometimes whole strata are met with, consisting merely of a quantity of shells of this sort, grown together. They are generally small, never exceeding an inch and a half in length. They are found in two different states of petrification ; one shews always the impressions of the elevated and hollow surfaces of the shells, without any vestige of the shells themselves. In the other appears the real shell sticking in the stone, and by its light colour is easily distinguishable from the stone. Both these kinds are plentiful in the stone ; however, the impressions are more in number than the real shells. Some of the shells are very elevated, especially in the middle, where they form as it were a hump ; others again are depressed in the middle ; but in most of them the outward surface is remarkably elevated. The furrows always run longitudinally, or from the top, diverging to the margin.

"*Petrified Cornua Ammonis*. These are likewise frequently found, but not equal to the former in number: like the *pectinita*, they are found really petrified, and in impressions; amongst them were some petrified snails.— Some of these *Cornua Ammonis* were remarkably big, and I do not remember seeing their equals, for they measured above two feet in diameter..

"Different kinds of corals could be plainly seen in, and separated from, the stone in which they lay. Some were white and ramose, or *Lithophytes*; others were starry corals, or *Madrepores*; the latter were rather scarce.

"I must give the name of *Stone-balls* to a kind of stones foreign to me, which are found in great plenty in some of the rock-stone. They were globular, one half of them projecting generally above the rock, and the other remaining in it. They consist of nearly parallel fibres, which arise from the bottom as from a center, and spread over the surface of the ball and have a grey colour. The outside of the balls is smooth, but has a number of small pores, which externally appear to be covered with a pale grey crust. They are from an inch to an inch and a half in diameter." *

The *Stone-balls* which Kalm saw were most likely the puff-ball variety of *Chatetes Lycoperdon*, while the branched corals of which he speaks were the other kind. Kalm visited North America in 1749. He was sent to America by the Royal Academy of Sciences at *Stockholm*, "to make such observations and collections of seeds and plants as would improve *Swedish* husbandry, gardening, manufactures, arts, and sciences." His book is full of remarks upon things in this country which are not even yet much observed here.

Chatetes Lycoperdon is the most abundant of all the Lower Silurian corals. It ranges from the chazy limestone upwards to the Niagara group, and is found in England, Ireland, Sweden, Russia, and in fact in all countries where the Silurian rocks are to be seen. In Canada, sometimes thick beds of limestone are often met with, composed almost altogether of the fragments of this coral.

Chatetes appears to be from the Greek, *Chaite*, hair, and the genus was so called, probably from the hair-like smallness of the tubes. *Lycoperdon*, (a puff ball.) By many Geologists this genus is called *Stenopora*. *Stenopora* is from the Greek; *Stenos*, narrow or small; and *poros*, a passage or pore.



Fig. 14.

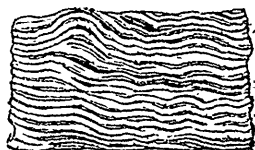


Fig. 15.

Figs 12 and 15.—*Stromatocerium rugosum*, (Hall.)

Concerning the true nature of this fossil there appears yet to be some doubt. It consists of numerous broad wrinkled leaves, penetrating the rock with their edges upward. They are generally bent in a half circle, as shown,

in Fig. 12, the diameter of the masses being from one to twelve or more inches. It is found abundantly in the Black River Limestone, generally accompanied by *Columnaria alveolata*, but as its internal structure has not yet been explained, the family of coral to which it may belong cannot be pointed out. The generic name is from *stroma*, a layer or lamina; and *cerion*, a honey-comb.

The above five species of fossil corals are those most commonly met with in the Lower Silurian rocks of Canada. There are a few other species not so abundant, which will be described hereafter.

On turning back to the classification of the animal kingdom given on page 31, it will be seen that the department RADIATA is divided into three classes Sea-urchins, Jelly-fishes, and Polyps. The latter are also subdivided into three orders, *Hydroids*, *Actinoids*, and *Rhizopods*. The Trenton Limestone corals are all *Actinoids*, with the exception of the last one described. *Stromatocerium rugosum*, the true position of which has not yet been ascertained. From the descriptions above given, it is not difficult to understand why the corals should be called radiated animals.

ARTICLE XVIII.—*On some of the technical terms used in the description of Fossil Shells.*

The language used in the science of palæontology appears to the beginner unintelligible, and devoid of interest, but when understood, it will be found full of meaning and exceedingly convenient. In the description of fossil shells, although at first sight one is liable to be impressed with the idea that there are a great many hard words to be learned yet upon a further acquaintance with the subject, this difficulty will appear to have been over-rated. There are in fact in this extensive branch of Natural History only a few technical terms in use, and most of these may be comprehended after a few minutes study.

It is not necessary in this work to enter into a detailed interpretation of such words as hemispheric, cylindrical, tumid, gibbous, quadrate, sub-quadrate, rhomboidal, sub-rhomboidal, globose, or sub-globose. Nearly all general readers are either already acquainted with the meaning of these, or by reflecting a moment may arrive at their import, or by referring to any good dictionary of the English language, ascertain the sense in which they are used. It may be proper to state that the prefix "sub," is used to denote an inferior degree, as in the words quadrate, approaching in form to the square and sub-quadrate, not so near the square as quadrate. The possession of a good dictionary and the habit of referring to it will be found sufficient for the greater number of cases. Unless, however, the reader is also a collector, the explanations will be of no practical value. Specimens may be collected from almost every quarry or exposure of rock in the settled portions of this country. We would strongly recommend some attention to this pursuit during those leisure hours of which most persons have more or less.

On examining one of the common clam-shells, as they are popularly called, of our rivers, it will be seen that the hard parts of the animal consist of two pieces joined together at the back, where each opens upon the other like a door upon its hinges. These shells are concave, so that when closed there is a considerable space within, occupied by the soft parts of the animal. The two shells are called valves, the joint where they are connected together is the hinge, and the small protuberances on the edge of the hinge, the teeth. Similar terms are used in describing fossil shells.



Fig. 1.



Fig. 2.



Fig. 3.

In the Brachiopoda, such as the *Lingula*, *Orthis*, *Spirifer*, *Leptena*, *Strophomena*, and others, there are two valves, and it has been ascertained by the dissection of specimens of those species at present living in the oceans, that one of these valves is placed upon the back and the other on the ventral side of the animal. Hence they are called dorsal and ventral valves. Fig. 1 shews the ventral valve of *Orthis tricenaria*, a Trenton Limestone species, very abundant in that rock at the lower end of the Allumette Island on the Ottawa. Fig. 2 is a dorsal view of the same specimen; in this figure it will be observed that the dorsal valve is shorter than the other. It extends only to the straight line across the figure near the top. The broad triangular space above the line is a portion of the ventral valve. Fig. 3 is a side view of a specimen shewing how the ventral valve projects above the other in a sharp hook-like termination, which is called the beak. Both valves have a beak, but that of the ventral is almost always the largest, and projects the highest. The hinge line is simply the hinge portion of the shells.



Fig. 4.



Fig. 5.

Fig. 4 is an end view of *Orthis tricenaria* looking at the hinge, the ventral valve being uppermost. The valves are each terminated by a flat space, as if they had been cut off with a knife. These constitute what is called the "cardinal area," "hinge area," or simply "the area." The area in the genus *Orthis* is penetrated in the centre by an angular aperture, shewn in fig. 4, by the lozenge-shaped black space in the centre. Through this aperture it is supposed the pedicle passed, by which the animal was attached to the bottom of the sea. It is called the "foramen," or "fissure." It consists of a triangular notch in each valve, deepest in the ventral valve.

Fig. 5 is the end of a dorsal valve of the same species, the ventral being removed to shew some of the internal appendages. The two projecting points are supposed to have been the supports of the fleshy arms which constitute the distinguishing feature in the organization of the Brachiopoda. The arms were long, slender, fleshy, string-like appendages, fringed with rows of hair-like tentacula; and used by the animal for capturing its food. These supports of the arms are longer in *Orthis tricenaria* than in any other species of this genus we have seen. They can only be observed, however, in well preserved specimens. They are sometimes called *cardinal teeth*, or *dental laminae*. They might be termed *brachial processes*. Between these is seen a third small triangular projection. This is situated in the fissure of the dorsal valve, and is called the *rostral tooth*, or *boss*. It is not however a tooth in the sense in which that term is used in Conchology, but simply a shelly process or projection to which a muscle was attached for the purpose of opening the valves. This is the opinion of the most modern authors.

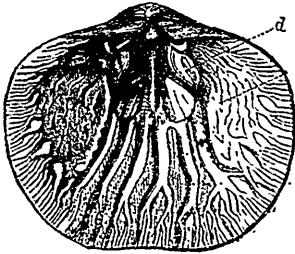


Fig. 6.

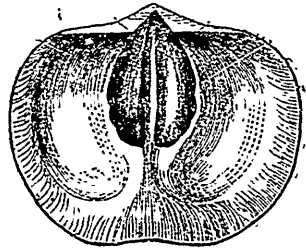


Fig. 7.

Figs. 6 and 7 shew the interiors of the dorsal and ventral valves of another species of *Orthis*. In these the cardinal areas, triangular foramen, cardinal teeth, rostral tooth, &c., may be recognised.

Fig. 6 is the dorsal valve, and it has near its upper portion four oval scars or depressions two on each side. The letter d points to the uppermost on the right. The other is immediately below it. These two and the two on the other side corresponding to them are *muscular impressions*. They mark the positions of the bases of four muscles which were fastened in these pits and extended to the other valve. Their office was to close the valves, hence they are called *adductors*. In the ventral valve; Fig. 7, two long oval scars are also to be seen. These are the "*Cardinal muscular impressions*." The muscles inserted in these were attached at the other extremity to the "*cardinal process, or tooth*," in the fissure of the dorsal valve, and serve to open the shell. The branched-root-like marking in the dorsal valve are the "*pallial*" impressions.

It is not often that specimens can be procured which will exhibit all these various portions of the internal structure of the Brachiopoda, and it is not necessary therefore to proceed further at present with their examination. Sufficient has been pointed out for the general purposes of this work.

The genera are distinguished not only by their outward form, but also

by their internal structure, such as the position of the muscular impressions, the form of the processes for the support of the arms, and other characters which will be explained hereafter.

It is a good plan for the student to commence with learning to recognize species by the description given of their external form, since it is most usually in a condition in which the internal characters cannot be observed that these fossils are found. The insides of many species have never yet been seen, and in collecting specimens particular care should be taken of all those which exhibit the interior surface of the shell. Should any be found of those species whose internal structure has not yet been ascertained, they would be highly prized.

In the next article we shall give the characters of several of the genera, together with descriptions of a number of the species which occur in the Upper Silurian rocks, and it will be there seen how and to what extent the technical terms above explained may be made available.

ARTICLE XIX.—*On some of the Fossil Shells of the Niagara and Clinton Formations.*

Having in the last article explained a few of the technical terms used in palæontology we shall now proceed to describe several of the genera of fossil shells, first reminding the reader that these descriptions will be of little service unless to those who collect specimens. In Natural History and Geology physical action is necessary, in addition to reading and reflection. As all science consists in the understanding and explication of the operations of the laws of nature, so he that would comprehend the mysteries of any one department should observe personally, otherwise his knowledge must be merely theoretical. He will lose the enjoyments of learning, and only familiarize himself with the fruitless difficulties. An eminent Naturalist has said:—

“Our object in examining the stone, the rock, the lichen, the moss, the flower, the fruit, the insect, the bird, or the quadruped, is to exercise our faculties by learning how beautifully, and with what wisdom all things have been constructed, how wonderfully they are formed with relation to each other, and how manifestly they display a power of which we could form no conception were we not to attend to its working as exhibited by them. It is true we cannot fully comprehend the complicated relations of the most common objects, much less understand the ordination of the universe, or even of our own world; but we labour in hope, we are studying, some of us, no doubt very superficially—others more profoundly—the works of the Deity, and the more progress we make the more we glorify Him by an intelligent, not a vague admiration. There are some who aim at the knowledge of general laws, some who seek simple facts. Both parties will find enough to engage their faculties, and neither will do the work of the other sufficiently. There is no reason why one should despise the other. Contempt of anything

but vice, indicates an unsound mind, a defective judgement, an ignorance of the relations which men have to each other, and to their Creator, an undue self-estimation and a contempt of the rights of other men. He who measures the orbit of a comet has not, therefore, higher faculties than he who examines the cytotblast of a fungus; and there is far more to be seen by us in a beetle than in a planet—upon that granite mountain opposite, at the distance of nine or ten miles, than in the sun and the moon and the stars.” *

In Geology some of the principal truths that break upon the mind from actual examination of the various formations of rock are, the amazing antiquity of the earth, the enormous revolutions that have taken place on its surface, the number and vastness of the convulsions to which it has been subjected, the strange forms of the races of animals by which it was inhabited during the many long and dark ages that rolled away previous to the creation of *m. n.* and most important of all the perception of the great fact that throughout all the prodigious changes and disturbances, all has been continually under the government and direction of some unseen power which is the same now as it was in the first ages. The operations of to-day may be traced back and connected link by link with those the most ancient, and thus it can be shewn that they constitute the work of but one mind; that amid all physical and vital subversions, there has been no change of rulers in nature. The creations and destructions of myriads of races of animated beings are events that have followed each other in a regular unbroken procession under the marshalling and direction of the same will. The same procession is still moving grandly onward, but how much of it there is still to go by science cannot tell. We can by simply going out into the fields and collecting and comparing specimens, ascertain the forms of those that have passed, but what these may be like which are yet to come is a problem reserved for the future.

The fossils intombed in the rocks of Canada, are the remains of the creatures that appeared in the commencement of the procession of life.—They may be called the old advance-guard. It is long since they passed, perished, and were buried. They are all of extinct species, most of them of extinct genera, while a very large proportion are even of orders that have now no representatives on earth. Those described in the following article are more or less abundant in those oceanic deposits of Western Canada, known as the Clinton and Niagara Groups, and although most of them are small in size, yet each forms a portion of the history of the world, and cannot be too carefully studied. They shew that when the great beds of rock were formed, over which the Niagara now rolls its waters, this country was beneath a vast sea, and that the life of that sea was totally different from that of the present oceans. If the mind can receive any benefit from musing over the history of fallen nations, surely something in the way of intellectual improvement must accrue from the study of the much higher truths of the extermination of worlds of animated beings.

* Extract from the *Natural History of Dee Side & Braemar*; by the late *Wm. MacGillivray, M.D.*

GENUS ORTHIS, (Dalman.)

The shells of the Genus *Orthis* are usually small, few of them exceeding one inch in diameter; they are generally nearly circular or quadrate, the hinge line is straight, and in most of the species shorter than the width of the shell. The valves are either equally or unequally convex, the ventral valve is often the longest, the beaks are more or less incurved, that of the ventral valve generally most prominent. The surface usually striated or ornamented by ridges radiating from the beak to the margin. Both valves have an *area*, and the foramen is partly excavated in both. The foramen of the dorsal valve is partly filled by a small cardinal tooth-like process, from which a small rounded ridge proceeds along the interior surface of the shell with two muscular impressions on each side, placed obliquely one above the other, (see fig. 6, page 130.) The muscular impressions in the ventral valve consist of two elongated depressions beneath the beak, usually divided by a small mesial ridge, (see fig. 7, page 130.) From each side of the foramen in the dorsal valve, two small, slender processes project, to which were, no doubt, fastened the free fleshy spiral arms. Many of the species have also a small tooth on each side of the foramen of the ventral valve.

The genus commenced to exist in the Lower Silurian epoch and continued until the carboniferous period, above which no specimen have been found.

GENUS STROPHOMENA, (Rafinesque.)

In this genus the shells have a very straight hinge line which is generally as wide or wider than the body of the specimens. They are semi-circular, semioval, or quadrate in form. One valve is convex, and the other concave on the outside. The two valves curve into each other; sometimes it is the ventral and sometimes the dorsal, which is concave. The *area* occupies both valves; it is largest, and partly covered by a thin shelly growth called the "deltidium," in the ventral valve. The beak of the ventral valve is either entire or perforated by a small circular aperture. The foramen in the dorsal valve is also partly occupied by a cardinal boss or process. The muscular impressions in the dorsal valve are not situated one above the other as in *Orthis*, but beside each other in a direction across the valve. Those in the ventral valve occupy a saucer-shaped cavity near the beak.

The genus appeared in the Lower Silurian and continued into the carboniferous epoch.

GENUS LEPTENA, (Dalman.)

The same as *Strophomena*, except that in the ventral valve the muscular impressions are not bordered by a ridge forming a saucer-shaped cavity, while in the dorsal valve they are large and long, extending from near the beak downwards two-thirds of the length of the shell.

The genus commenced in the Lower Silurian and continued to the latter part of the Lias period.

GENUS ATRYPA, (Dalman.)

The shells of the Genus *Atrypa* are often of a globular form, but sometimes elongated or sub-triangular, and most pointed at the beaks, which are small and incurved, or hook-shaped. The surface is sometimes smooth, but often ornamented with a number of ridges which radiate from the beak, (see figures 11 and 13.) The dorsal valve is the shortest, and the beak of the ventral usually curves over it. It has moreover an elevation or mesial fold in many species extending from the beak to the base, while the ventral valve has a corresponding depression or sinus. Within, the arms are coiled, forming two conical spires, the bases of which are towards the ventral and the spires in the hollow of the dorsal valve. In the interior of the dorsal valve the muscular impressions are separated by a small ridge extending from the beak downward, and in the ventral valve they are situated in a saucer-shaped depression under the beak. The beak is sometimes perforated by a small circular aperture.

This genus ranges from the Lower Silurian to the Devonian. *Atrypa* is from the Greek, (*a.*) without; and (*trupa*.) a perforation. Some of the species are however perforated.

GENUS SPIRIFER, (Sowerby.)

In this genus the ends of the spires are directed outwards towards the angles of the shell instead of into the hollow of the dorsal valve, as in *Atrypa*. These spires were first discovered in species of this genus, and hence the name from the Latin, (*Spira*.) a spire; and *fero*, I bear.

The spirifers have usually a long straight hinge line, a mesial fold on the dorsal, and a sinus in the ventral valve. They are either smooth or ornamented with radiating ridges. The angles at the ends of the hinge line are often extended, forming acute or rounded points or ears, as they are sometimes called. The beaks are either straight or curved. Both valves have an area often very small on the dorsal. Both have also a foramen, partly closed in the ventral valve.

The genus commences in the Lower Silurian and becomes extinct in the Frías.

The above are the principal characters of the five genera of Brachiopoda most abundant in species in the Silurian rocks. As the interiors of the shells are not often seen, we have thought it not necessary to incumber the reader with more lengthened descriptions. By comparing the figures of the species and collecting and examining specimens, the distinctions may be soon perceived. It should be remarked that the species described in this work, as belonging to the genus *Atrypa*, have not been yet proved to belong to that genus. Their internal characters are for the greater part unknown, and they have therefore been all classified by Professor Hall as *Atrypæ* for the present.

The following are the species from the Clinton and Niagara Groups, figured on plate 2:—

Fig. 1, (*Orthis circulus*.) CLINTON GROUP.—This little shell is nearly

circular, wider than high, and nearly equivalved. The surface is covered with numerous fine elevated lines or radiations. These curve outward as they proceed upward, and some of them run out on the hinge line. The area is narrow, and in length but little more than one-third of the width of the shell. The ventral valve is somewhat flattened near the base, and it is provided with a small beak which curves slightly over the area. The beak of the dorsal valve scarcely rises above the area line. There are a few fine concentric lines scarcely visible. The depression in the ventral valve is accompanied by a corresponding elevation on the dorsal valve.

Figs. 2 and 3, (*Spirifer radiatus*), CLINTON AND NIAGARA GROUPS.— This is a fossil whose form is exceedingly variable, and is found in the Silurian rocks of both England and America. We shall therefore give the descriptions of authors in both countries, changing the names of the valves :

Professor Hall thus describes it :—“Shell variable in form, sub-triangular, rotund or subglobose, valves almost equally convex, the beak of the ventral valve more or less extended, and curving over the dorsal valve, hinge line often less than the width of the shell, the extremities being rounded, surface marked by fine close radiating striæ, mesial elevation and depression moderate, marked by the striæ as in other parts of the shell, dorsal area more or less exposed, and giving a very variable appearance to the shell, foramen narrow and long, often partially or entirely closed by a callosity, interior plates of ventral valve near together, and extending downwards within the limit of the mesial depression.” *

Figure 2, shews a specimen with the ventral valve extended into a very high and curved beak, with a large area beneath. In Fig. 3, the beaks of the two valves are nearly of equal height, and so curved together that the area is nearly closed. Some of the specimens are twice the breadth of fig. 3, and with the angles more rounded. The mesial sinus, or depression, is always in the ventral, or larger valve, and the mesial elevation on the dorsal, or shorter valve. In fact this is their situation in nearly all the Brachiopoda. The following is Professor McCoy's description of the English specimens :—

“Transversely subrhomboidal gibbous, hinge-line slightly less than the width of the shell, cardinal angles obtusely rounded, ventral valve with a large incurved beak, and a wide deep rounded mesial hollow, extending from the apex to the front margin, which is abruptly raised into a deep quadrate sinus, sides gibbous, dorsal valve with a very prominent rotundato-quadrate mesial ridge, strongly defined from the beak to the sinus in the front margin, sides tumid, surface radiated with very fine, close, nearly equal, thread-like striæ, occasionally (23 in 3 lines, at 6 lines from the beak,) casts of ventral valve shew the slightly diverging slits of two extremely thick dental lamellæ. Average width, 1½ inch.”

“Common in the Ludlow rock, Keeper's Lodge, Golden Grove, Llan-dello, Caermarthenshire.” †

This fossil on account of its extremely variable form occasions much

* Palæontology of New York, vol. 2, page 66.

† Sedgewick & McCoy's British Palæozoic Fossils, page 195.

perplexity to amateurs, and can only be well understood by collecting and observing frequently numerous specimens, thus familiarizing the eye with its appearance, and ascertaining its gradations of form. It occurs in the Clinton group, and less commonly in the Niagara shale.

Fig. 4. *Atrypa congesta*, (Conrad,) CLINTON GROUP.—This species is nearly globular, or ovate, with a deep sinus which commences at the beak.—The shells are in most instances smooth, or only marked by concentric striæ. On each side of the sinus and mesial fold there is an additional fold, well shewn in the figure. The beak of the ventral valve is strongly incurved, or hooked over the dorsal valve. Professor Hall says “it is readily recognised in its usual appearance by its rotund and gibbous form. The variations are mainly due to the greater development of the carinæ on either side of the mesial fold and depression, which sometimes give the shell a different character, having three prominent folds on the dorsal and four on the ventral valve.—This change usually takes place in the older individuals, while the younger ones present only the mesial fold and depression. The specimens usually found are smooth, the striæ having been worn or dissolved away; but in perfect specimens they appear as fine raised thread-like lines.”

The species is found in the Clinton group. One of the localities given by Professor Hall, is Flamborough Head, Canada West. *Congesta*, consisting of heaps.

Figs. 5 and 5, (*Orthis elegantula*), CLINTON AND NIAGARA GROUPS.—This species much resembles *Orthis testudinaria* of the Lower Silurian rocks. The dorsal valve is nearly or quite flat. The ventral valve with a highly elevated beak curving over the area. The surface is covered with fine striæ. The size is about that of the figures.

It occurs in all the localities of the Niagara shale, and also in the Clinton group, and is abundant in Europe. Like its near relation *O. testudinaria*, it therefore has a wide geographical distribution.

Fig. 6, (*Orthis flabellum*), NIAGARA GROUP.—This fossil is thus described by Professor Hall:—“Shell semioval, hinge-line equal to the width of the shell, surface marked by twenty-four to thirty simple rounded plications, which are equal to the space between them, plications usually smooth, with the remains of concentric striæ crossing the depressions between, and rarely appearing on the elevations, a few strong imbricating lines of growth near the base, cardinal area usually narrow, and extending to the extremity of the hinge line.”

“It is usually found so much flattened that the two valves appear to be equal. The ventral valve in perfect specimens is more convex than the dorsal. The foramen is broadly triangular with a thin sharp tooth in the centre and a stronger one on each side projecting into the centre, the muscular impression has a strong rounded ridge down the centre with a depression on each side, but the margins are not well defined. The interplication on the inside appear to be duplicate, or have a groove along the centre. In some specimens the plications on the interior extend but half-way to the beak; while in others, that are apparently of the same species, they extend to the muscular impression.”

This species occurs in the shale of the Niagara group. There is a species of the same name in the Lower Silurian rocks of England, and Prof. Hall considers these American specimens to constitute a variety of the English species. *Flabellulum*, Latin, a "little fan."

Fig. 7, *Spirifer sulcatus*, (Hisinger,) NIAGARA GROUP.—"Shell subtriangular and gibbous, cardinal line more or less extended, often pointed at the extremities, surface plicated, plications four to seven on each side of the mesial fold and sinus, crossed by strong imbricating lamellæ, and longitudinally marked by fine striæ which are interrupted by the edges of the lamellæ, mesial fold of the ventral valve very deep towards the base of the shell."

This species is readily distinguished by its roughly lamellate surface.—It is one of the most common forms in the Niagara Group. It is found also in the Silurian rocks of Europe. *Sulcatus*, Latin, furrowed.

Fig. 8, *Spirifer Niagarensis*, (Conrad,) NIAGARA GROUP.—"The surface of this shell is marked by from twenty to thirty rounded plications, and these are also striated longitudinally by fine equal striæ. The mesial elevation consists of a single large fold, and the sinus of a corresponding depression.—It is a large shell when full grown, and both valves are about equally convex. The ventral valve has the beak elevated and incurved over the area, which is of medium size. The hinge line is usually shorter than the shell, and the ears are rounded. The young shells have only ten or twelve plications on their surfaces.

This fossil is typical of the Niagara Group, and is readily recognized by its rounded plications, which are evenly striated in a longitudinal direction. It occurs in the shale, and rarely in the limestone of the group.

Fig. 9, *Atrypa nitida*, (Hall,) NIAGARA GROUP.—"Shell ovoid, with the beaks more or less extended, surface smooth, or with fine concentric striæ and a few conspicuous lines of growth towards the base, and sometimes on the middle of the shell, valves nearly equally convex, the beak of the ventral valve being much elevated above, and incurving over the dorsal valve, the ventral valve sometimes marked near the base by a longitudinal depression."

This species is very abundant in the shale of the Niagara group, and somewhat variable in form. It usually has a smooth surface. It is most abundant at Lockport. *Nitida*, Latin, smooth.

Fig. 10, (*Atrypa reticularis*.) LINNÆ.—This fossil has a very great vertical range, being found in many of the formations from the Clinton upward to the Chemung group. It is nearly circular. The ventral valve is much more convex than the dorsal. The surface is ornamented by from 24 to 30 small rounded plications which bifurcate about one-third of the distance from the beak to the margin, these plications are crossed by concentric elevated lamellæ which give to the surface a reticulated appearance, whence the specific name *reticularis*, net-like, or reticulated. The dorsal valve has often a shallow depression or sinus at the base, and the other a corresponding elevation. The beak of the dorsal valve is small, and but slightly elevated above the ventral valve or hinge line. The cardinal angles are sometimes a little extended beyond the width of the shell.

Figs. 11 and 12, *Atrypa neglecta*, (Hall,) NIAGARA AND CLINTON GROUPS.—Professor Hall says this shell is “ovoid or subpyramidal, beak acute, shell gradually enlarging from the beak to the base, which, in old shells, is deeply sinuate; dorsal valve more convex than the ventral valve, surface marked by simple sharp plications, which are crossed by fine concentric striæ, and sometimes by a few imbricating lines of growth; ventral valve with a mesial sinus below the middle, and a corresponding fold upon the dorsal valve.”

“In the young shells the valves are equal, and there is neither sinus or elevation; but as the shell advances in size, the sinus becomes conspicuous. There are generally three, and sometimes four plications in the sinus, and four or five elevated on the opposite valve. The plications usually appear as if smooth, except near the base where there are some strong imbricating lines of growth. It is a very common species, and sufficiently distinct in all its phases to be readily recognized.”

It is found in all the localities of the shale of the Niagara Group, and it also occurs in the Clinton group.

Fig. 13, (*Atrypa cuneata*), DALMAN.—The principal character of this species is its long triangular shape. The plications are ten or twelve, three or four depressed on the ventral, and elevated on the dorsal valve. The beak of the ventral valve is nearly straight, and perforated at the extremity.—This shell is somewhat variable in shape, and the specimens are usually flattened and distorted. *Cuneata*, Latin, wedge-shaped.

It occurs in the Niagara shale, and also in several countries in Europe in the Silurian rocks.

Figs. 14 and 15, *Leptena transversalis*, (Dalman,) NIAGARA GROUP.—This species is semi-circular, and the ventral valve very convex, while the dorsal valve is equally concave. The hinge line is sometimes equal to and often longer than the width of the shell, as in fig. 14. The surface is marked by a number of elevated radiating ridges, the intervals between which are more finely striated. Professor McCoy says of the English specimens, that they are more globose than *Leptena sericia*, and “distinguished externally by the fewer and more distant linear ridges, and the very much finer longitudinal striæ between the thread-like ridges, and their being besides so faintly impressed as to be, in almost all cases, invisible to the naked eye, or a lens of low power. The interior of the dorsal valve shews well the long parallel muscular impressions. Fig. 15 is a view of the hinge line, exhibiting the elevation of the marginal ridges by which these impressions are bounded.—This is one of the most abundant of fossils in the Upper Silurian rocks of America, and we have specimens in our possession from the Trenton Limestone that much resemble it. In Europe it is also quite common.

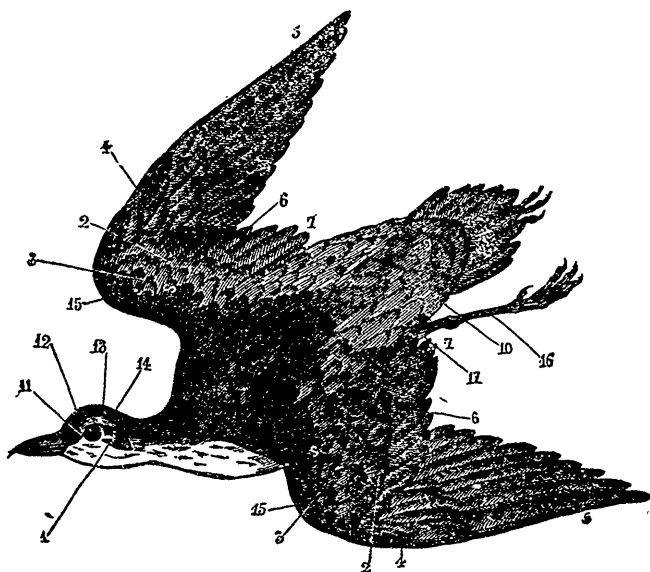
Figs. 16 and 17, *Leptena subplana*, (Conrad,) NIAGARA GROUP.—This shell is “semi-elliptical, length and width nearly equal, hinge line extending beyond the width of the shell. The surface is marked by prominent sharp striæ, which frequently bifurcate before reaching the margin. The radiating striæ are crossed by strong concentric striæ. The area (Fig. 17,) extends

to the extremities of the hinge line, and is narrow, and partially formed by both valves." The valves are almost equally convex, one being usually quite flat, except near the beak, while the other is plano-convex at the beak and slightly convex below. *Subplana*, flattened.

It occurs in the Niagara shale, the most perfect specimens being found adhering to the thin calcareous layers.

The above descriptions, as well as the figures, are principally taken from the second volume of that magnificent work, the *Palæontology of New York*. In this magazine there is not space to enter into elaborate details. Our plan is to publish at first just so much as may serve to introduce each species to the reader, and afterwards to give further particulars, with notices of Canadian localities. The student must not be discouraged if after several attempts he fails to recognise some of the species, but should rest assured that by further application he will succeed.

ARTICLE XX.—Ornithology; Technical terms.



The remarks made concerning the collection and examination of fossils in our previous articles will apply also to birds. There are a few technical terms to be acquired, and these will require only a few minutes study. The best method of proceeding is to procure a specimen of some common species, such as the Robin, and examine the plumage, book in hand. The advantage of understanding the technical terms consists in this, that this knowledge will

enable the student to ascertain the name of rare species from the short descriptions given in such works as Audubon's Synopsis of the Birds of America, without purchasing the expensive books in which alone they are well figured. In this Journal it cannot be expected that figures of many birds can be given, and for the common species it is not necessary, as no drawing can equal the originals, which can be procured at any time.

The diagrammatic figure given above is taken from Lewis' American Sportsman, and so are the following explanations of the technical terms :—

1. *Auriculars, the ear coverts.*—The soft feathers that cover the organs of hearing.

2, 2. *The bastard wing*, consisting of three or five feathers, resembling the quills of the true wing ; they are placed on a small bone rising from the wrist-joint of the wing. *The bastard wing* assists in flight by keeping the wing from turning upwards, and contracts the points of the wing in a downward and backward position to that of the course of the Bird through the air.

3, 3. *The lesser coverts of the wings.*—These are the feathers which are found in successive rows upon the wings ; those on the inside are termed *under coverts*, and are much less regarded by Ornithologists as a means of distinction than the others.

4, 4. *The greater coverts.*—The wing feathers lying under the *lesser coverts* ; they are much larger and stronger than the latter.

5, 5. *The primaries.*—Large quill feathers taking their growth from below the wrist-joint. The length and proportion of the feathers control, in a wide degree, the movements of the Bird in the air. The nearer the longer *primary quill* approaches the body, the more dexterous and beautiful will be the motion of the Bird when on the wing. The *Hawks, Swallows*, and various other Birds of rapid flight, that seize their prey when on the wing, have the longest *primary* feather very near the body, and consequently are enabled to turn and twist themselves with great facility.

6, 6. *The secondaries, or second quill feathers*, spring from the second bone of the wing. When the wing is extended, they frequently appear like a continuation of the *primaries*.

7, 7. *The tertiary, or third quill feathers*, also arise from the second bone, but much nearer the elbow-joint.

8, 8. *The scapulars, or shoulder feathers*, are formed by the soft and downy feathers that cover the shoulder-bones, and are serviceable only as a protection to the parts which they surround ; they unite without any regularity with the plumage of the back and wings.

9. *The rump feathers and upper-tail coverts.*—These feathers are the continuation of the covering of the back, and are strong in proportion to the peculiar habits of the Bird. In the Woodpecker tribe, for instance, these feathers are very strong and unusually long, as they make constant use of the tail as a support and assistance when climbing the trunks of trees ; and so it is with some water-fowl not web-footed, but obliged frequently to take flight from the water. The *tail feathers* in these last-mentioned Birds afford the greatest assistance in springing into the air.

10. *The vent feathers and under-tail coverts*, that extend from the anus or vent to the tail underneath. These feathers are much longer in some tribes of Birds than others. Those that have a constant habit of flirting by their tails—like, for example, the *Tallus Carolinus*, and several species of small shore Birds—have the vent feathers unusually well developed.

The *tail feathers* are various in size and numbers, and are generally the most ornamental part of a Bird. The tail performs the most necessary office in the navigation of the Bird through the air; in fact, it is the rudder by which the course of the Bird is determined, and acts in concert with the will of the Bird as freely as a ship obeys her helm.

11. *Loral space*.—The space between the bill and eye.

12. *Frons*.—The forehead.

13. *Corona*.—Crown of the head.

14. *Occiput*.—The hind part of the head.

15. *Flexure*.—Bend of the wing.

16. *Tarsi*.—Shanks of legs.

17. *Tibia*.—Thigh.

The *upper and lower bills* are called the *superior and inferior maxilla*, or upper and lower *mandibles*.

Iris—irides.—The colored circle surrounding the pupil of the eye.

Mentum.—The chin.

Guttur.—The throat.

Collum.—The neck.

Pectus.—The breast.

In measurement, the *total length* means from point of the bill to the end of middle tail feathers. *Length of the wings* means from the *bend* of the wing to the end of the longest quill feather."

The *mirror, speculum or Beauty spot*, is a space on the wings of some species with brighter colours than the other parts of the wing.

The length of the wing is generally measured from the tip of one wing to the tip of the other, and the two dimension are simply expressed in figures thus, $24\frac{1}{2}$, $38\frac{1}{2}$; the first indicating the length from the bill to the tail, and the latter the length of the expanded wings.

The above are nearly all the technical terms used in describing birds, and after a few attempts at their application to specimens, they will become fixed in the memory, and give no further trouble. There are many systems of classification proposed by various authors, and to reconcile them all with each other would be impossible; in fact most of them are considered by the best naturalists to be defective, and need not be studied until after some knowledge of the species, and genera has been acquired.

Linnaeus, in his *Systema Naturæ*, divides the class of Birds into six orders. Blumenbach makes nine orders. Cuvier makes six. M. Vieillot, a celebrated French Ornithologist, five. Mr. N. A. Vigors, five. M. C. J. Temminck, in his *Manuel d'Ornithologie*, sixteen; and Professors Agassiz & Gould, in the system published in the second article of this Journal, only four orders.

A writer in the *Toronto Globe* of the 11th instant, condemns the system of Professors Agassiz & Gould, and expresses the greatest alarm lest the publication of it in Canada might be injurious to the cause of Natural History.

We have however so much confidence in the great name of AGASSIZ, that we feel justified in stating that the study of no one of his works will retard the student, and that we believe our anonymous reviewer in the *Globe* stands much in need of a small book, such as the "Outlines of Comparative Physiology and Anatomy," from which the system in question was taken. The five orders of Vigors are the following:—

1. *Raptores*.—Birds of Prey.
2. *Insessores*.—Perching Birds.
3. *Rasores*.—Scraping Birds.
4. *Grallatores*.—Wading Birds.
5. *Natatores*.—Swimming Birds.

In the system of Agassiz & Gould, the Insessores appear to include (1.) Birds of Prey, (2.) The Perching Birds of other authors, and (3.) The Scraping Birds; while their order of Scaisores or Climbing Birds is considered by Vigors as a tribe only of the Insessores.

In this Journal only species and genera will be described for the present. The student should procure specimens and study them, and acquire as soon as possible an extensive knowledge of species. He should also make observations upon the food, periods of migration, construction of nests, habits, instincts, &c., and commit the same to writing.

In the next article we shall give an account of the common Robin, with the technical description, by way of note, from *Audubon's Synopsis of the Birds of America*.

ARTICLE XXI.—*On the Robin, or Migratory Thrush, (Turdus migratorious.)*

GENUS TURDUS, (Linn.)

GENERIC CHARACTERS.—Bill of moderate length, rather stout, straight, compressed towards the end, and acute; upper mandible slightly notched near the tip; nostrils ovoid, partly concealed by the feathers; tarsus longer than the middle toe, wings of moderate length, first quill very small, the third and fourth longest, tail rather long, nearly even.

TURDUS MIGRATORIOUS, (Linn.)

SPECIFIC CHARACTERS.—*Dark greyish, beneath reddish, head and tail black, the latter with the two exterior feathers white at the tip; male, 10.14; female, 9.13. Inhabits the United States and British Provinces, to the Arctic regions.*

The Robin, the most common species of the family of Thrushes, is a fine lively bird to be seen everywhere in this country throughout the spring.

summer and autumn. It arrives in Canada from the South in the beginning of April, and while numbers of them remain with us, others extend their migration to the far-north; where, as well as in Canada and the United States, they breed. It received its common name from the first European emigrants, from a fanciful resemblance to the *Robin Red-breast* of the British Isles. This latter bird, however, is a member of a different genus, and in systematic works on Ornithology, is called *Erythaca rubecula*, or *Sylvia rubecula*. Our bird is not, properly speaking, a Robin, but a Thrush.— They spend the winter season in the southern countries of North America, but in summer, seem to spread over the whole continent. When we consider that two or three pairs may be seen in an hour's walk anywhere in the country, and that they are equally numerous all over the vast regions where they breed, some idea may be formed of their numbers in the Southern States: in the winter, when the whole race is gathered together in a small space.— In Canada the largest flocks are to be seen late in the autumn, when the northern birds are passing through on their way to the South. In the Hudson's Bay Territories, Sir John Richardson says:—"The male is one of the loudest and most assiduous of the songsters that frequent the fur countries, beginning his chant immediately on his arrival. Within the arctic circle, the woods are silent in the bright light of noon-day; but towards midnight when the sun travels near the horizon, and the shades of the forest are lengthened, the concert commences, and continues till six or seven in the morning." Its song consists of a number of loud warbling notes, delivered a few at each breath. Its call while feeding or hopping along the ground or fences, consists of several ejaculations, *pwee-shit, pwee-shit, pemp-pemp*, uttered frequently, and with much spirit.

The following is Wilson's account of the bird as observed in the United States:—

"The name of this bird bespeaks him a bird of passage, as are all the different species of Thrushes we have; but the one we are now describing, being more unsettled, and continually roving about from one region to another, during fall and winter, seems particularly entitled to the appellation.— Scarce a winter passes but innumerable thousands of them are seen in the lower part of the whole Atlantic states, from New Hampshire to Carolina, particularly in the neighbourhood of our towns; and, from the circumstance of their leaving, during that season, the country to the north-west of the great range of the Alleghany, from Maryland northward, it would appear that they not only migrate from north to south, but from west to east, to avoid the deep snows that generally prevail on these high regions, for at least four months in the year.

"The Robin builds a large nest, often on an apple-tree, plasters it in the inside with mud, and lines it with hay or fine grass. The female lays five eggs, of a beautiful sea-green. Their principal food is berries, worms, and caterpillars. Of the first he prefers those of the sour gum, (*Nyssa sylvatica*.) So fond are they of gum-berries, that, wherever there is one of these trees covered with fruit, and flocks of Robins in the neighborhood, the

sportsman need only take his stand near it, load, take aim, and fire; one flock succeeding another, with little interruption, almost the whole day: by this method, prodigious slaughter has been made among them with little fatigue. When berries fail, they disperse themselves over the fields, and along the fences, in search of worms and other insects. Sometimes they will disappear for a week or two, and return again in greater numbers than before; at which time the cities pour out their sportsmen by scores, and the markets are plentifully supplied with them at a cheap rate. In January, 1807, two young men, in one excursion after them, shot thirty dozen. In the midst of such devastation, which continued many weeks, and, by accounts, extended from Massachusetts to Maryland, some humane person took advantage of a circumstance common to these birds in winter, to stop the general slaughter. The fruit called poke-berries (*Phytolacca decandra*, Linn.) is a favorite repast with the Robin, after they are mellowed by the frost. The juice of the berries is of a beautiful crimson, and they are eaten in such quantities by these birds, that their whole stomachs are strongly tinged with the same red color. A paragraph appeared in the public papers, intimating, that, from the great quantities of these berries which the Robins had fed on, they had become unwholesome, and even dangerous food; and that several persons had suffered by eating of them. The strange appearance of the bowels of the birds seemed to corroborate this account. The demand for, and use of them, ceased almost instantly; and motives of self-preservation produced at once what all the pleadings of humanity could not effect. When fat, they are in considerable esteem for the table, and probably not inferior to the *Turdi* of the ancients, which they bestowed so much pains on in feeding and fattening. The young birds are frequently and easily raised, bear the confinement of the cage, feed on bread, fruits, &c., sing well, readily learn to imitate parts of tunes, and are very pleasant and cheerful domestics. In these I have always observed that the orange on the breast is of a much deeper tint, often a dark mahogany or chestnut color, owing, no doubt, to their food and confinement.

“The Robin is one of our earliest songsters; even in March, while snow yet dapples the fields, and flocks of them are dispersed about, some few will mount a post or stake of the fence, and make short and frequent attempts at their song. Early in April, they are only to be seen in pairs, and deliver their notes with great earnestness, from the top of some tree detached from the woods. This song has some resemblance to, and indeed is no bad imitation of, the notes of the Thrush or Thrasher, (*Turdus rufus*;) but, if deficient in point of execution, he possesses more simplicity, and makes up in zeal what he wants in talent; so that the notes of the Robin, in spring, are universally known, and as universally beloved. They are as it were, the prelude to the grand general concert that is about to burst upon us from woods, fields, and thickets, whitened with blossoms, and breathing fragrance. By the usual association of ideas, we, therefore, listen with more pleasure to this cheerful bird, than to many others possessed of far superior powers, and much greater variety. Even his nest is held more sacred among

schoolboys than that of some others ; and, while they will exult in plundering a Jay's or a Cat Bird's, a general sentiment of respect prevails on the discovery of a Robin's. Whether he owes not some little of this veneration to the well-known and long-established character of his namesake in Britain, by a like association of ideas, I will not pretend to determine. He possesses a good deal of his suavity of manners ; and almost always seeks shelter for his young in summer, and subsistence for himself in the extremes of winter, near the habitations of man.

“The Robin inhabits the whole of North America, from Hudson's Bay to Nootka Sound, and as far south as Georgia, though they rarely breed on this side of the mountains farther south than Virginia. Mr. Forster says, that about the beginning of May they make their appearance in pairs at the settlements of Hudson's Bay, at Severn River ; and adds a circumstance altogether unworthy of belief, viz., that, at Moose Fort, they build, lay, and hatch, in fourteen days ! but that at the former place, four degrees more north, they are said to take twenty-six days. They are also common in Newfoundland, quitting these northern parts in October. The young, during the first season, are spotted with white on the breast, and in that time have a good deal of resemblance to the Fieldfare of Europe.

“Mr. Hearne informs us, that the red-breasted Thrushes are commonly called, at Hudson's Bay, the Red-Bird—by some, the Blackbirds, on account of their note—and by others, the American Fieldfares ; that they make their appearance at Churchill River about the middle of May, and migrate to the south early in the fall. They are seldom seen there but in pairs ; and are never killed for their flesh, except by the Indian boys.

“Several authors have asserted, that the red-breasted Thrush cannot brook the confinement of the cage, and never sings in that state. But, except the Mocking Bird, (*Turdus polyglottus*.) I know of no native bird which is so frequently domesticated, agrees better with confinement, or sings in that state more agreeably than the Robin. They generally suffer severely in moulting time, yet often live to a considerable age. A lady, who resides near Tarrytown, on the banks of the Hudson, informed me, that she raised and kept one of these birds for seventeen years ; which sang as well, and looked as sprightly, at that age as ever, but was at last unfortunately destroyed by a cat. The morning is their favorite time for song. In passing through the streets of our large cities, on Sunday, in the months of April and May, a little after daybreak, the general silence which usually prevails without at that hour, will enable you to distinguish every house where one of these songsters resides, as he makes it then ring with his music.”

The Robin belongs to the family TURDINÆ or Thrushes, of which there are three genera and a goodly number of species known in North America. In the classification of Agassiz & Gould, this family belongs to the order *Insectores*. The generic name is from *Turdus*, Latin, a Thrush. The specific name *migratorius*, (incorrectly printed *migratorious* at the commencement of this article.) is derived from the Latin verb *migro*, to remove from one place to another.

The subjoined description of the Robin is taken from Audubon's Synopsis of the Birds of America, page 89 :—

Turdus migratorius, LINN. Migratory Thrush.—Robin.

Male with the bill yellow, the upper part and sides of the head black ; upper parts dark grey with an olivaceous tinge ; quills blackish-brown, margined with light grey ; tail brownish-black, the outer two feathers tipped with white ; three white spots about the eye, throat white, densely streaked with black ; lower part of fore neck, breast, sides, axillars, and lower wing-coverts reddish-orange ; abdomen white ; lower tail-coverts dusky, tipped with white. Female with the tints paler. Young with the fore neck, breast, and sides, pale-reddish, spotted with dusky, the upper parts darker than in the adult. Bill at first dusky, ultimately pure yellow.

Male, 10, 14. *Female*, 9, 13.

From Texas eastward and northward, to the Fur Countries. Throughout the interior. Winters in abundance in all the Southern States. Columbia River. Abundant.

Robin, *Turdus migratorius*, WILS. Amer. Orn. v. i. p. 35.

Turdus migratorius, BONAP. Syn. p. 75.

Merula migratoria, Red-breasted Thrush, SWAINS. & RICH F. Bor. Amer. v. ii. p. 176.

American Robin or Migratory Thrush, *Turdus migratorius*, NUTT. Man. v. i. p. 338.

American Robin or Migratory Thrush, *Turdus migratorius*, AUD. Orn. Biog. v. ii. p. 190 ; v. v. p. 442.

Merula migratoria, DEKAY, Nat. Hist., New York.

ARTICLE XXII.—On Black Duck, (*Anas obscura*.)

GENUS ANAS, (Linn.)

GENERIC CHARACTERS.—The bill depressed or flattened towards the end ; the upper mandible with a small ovate beak ; the nostrils elliptical and situated near the ridge of the bill, behind the centre of its length ; feet short, stout, placed a little behind the centre of the body ; hind toe very small, third toe longest, fourth a little shorter, but longer than the second ; tail short, much rounded, of 14 to 19 feathers. The name of the genus is Latin, *Anas*, a Duck.

ANAS OBSCURA, (Black or Dusky Duck.)

SPECIFIC CHARACTERS.—*Male*, blackish-brown ; *female*, lighter brown ; *male*, 24 $\frac{1}{2}$, 38 $\frac{1}{2}$; *female*, 22, 34 $\frac{1}{2}$. Inhabits North America, from Texas to Hudson's Bay Territories.

The following particulars concerning this fine bird were obligingly prepared for us from his own observation by Mr. Wm. P. LETT, of Ottawa, an ardent and skilful sportsman, and who, in the amount of his knowledge of the water-fowl that visit this portion of Canada, has few, if any equals. Mr. LETT says :—

“The Black Duck is one of the largest species of the duck tribe which visits Canada. It generally makes its appearance here about the 5th of April, and remains throughout the summer until the latter end of October, when it leaves for the South. Few, however, are to be met with in the breeding season, which extends from the 20th of May till the 15th of August. The young are then able to fly, and are much easier to approach than at any other season.

"This species feeds near the shores of streams, and may be found generally in small creeks, lakes, and inland ponds. Its food principally consists of seeds, insects, and small aquatic plants, and it is also fond of grain of different kinds. Large flocks often resort in spring, when the banks of the small rivers are overflowed, to stubble fields, particularly where oats have been sown, and solitary pairs are very frequently met with in small pools in fields and meadows adjacent to rivers.

"The Black Duck, seldom, or never dives when feeding; but when wounded, if, for instance, only a wing is broken, it is one of the most cunning and expert divers to be found. In this case, if one is shot when flying and happens to fall into the water, unless the sportsman is experienced in the business, and has a second barrel ready to discharge immediately, there are ten chances to one that he does not get another sight of his game after the first dive. Under such circumstances, they will rise to the surface of the water, exposing only the head as far as the eyes, and the instant they have taken breath, or fancy themselves seen, the head is again drawn under water. In this manner they will dive a distance of ninety or one hundred yards.

"The Black Duck, however, when wounded, invariably resorts to the shore, and travels on land sometimes nearly an acre from the waters. If the sportsman can boast the possession of a well trained dog with a keen nose, his chance is still good. The instant such a dog strikes the trail of the wounded bird, he will follow it up with unerring certainty, and capture the game.

"This fine species of duck is exceedingly wary and difficult to approach, except on ground where the shore cover is thick. The least noise, the breaking of a dry twig, for instance, puts them on the alert, and the appearance of man, even at a distance of three hundred yards, will cause them to take wing. The only time at which they can be approached easily, is at the dawn of the morning when they first make their appearance at their feeding grounds. Except at this early hour, when alarmed, they will rise to a great height in the air and fly a long distance before they again alight; and it is invariably more difficult to approach them after being once alarmed, than at first.

"The flesh of this species, if not superior, is at least equal to that of any other known. It is fully equal to that of the tame duck, to which latter it bears a very full and marked resemblance in form and size. Its uniformity of plumage, however, will give it a claim to distinctiveness as a species, although it may be a question whether it has not a strong claim to be a part of the parent stock of the domestic duck as well as the wild mallard.

"The black duck breeds here on the banks of remote streams and small creeks and lakes. The female lays from twelve to fourteen eggs, and may often be seen with a dozen young ones following her early in the month of July. Of these, probably about six or eight, frequently a fewer number, arrive at maturity, owing to their exposure to the attacks of the "Mink," the "Weasel," and other small predatory animals, from the ravages of which, together with the fox, large numbers of the young broods are destroyed before they are able to fly.

“The flesh of the young birds, at the season, when they are called “*Flappers*,” is very tender and delicious, and it is a matter of regret that very many of them are then killed for the table.”

The following are Wilson's remarks on this species:—“This species is generally known along the sea-coast of New Jersey, and the neighbouring country, by the name of the Black Duck, being the most common and most numerous of all those of its tribe that frequent the salt marshes. It is only partially migratory. Numbers of them remain during the summer, and breed in sequestered places in the marsh, or on the sea-islands of the beach. The eggs are eight or ten in number, very nearly resembling those of the Domestic Duck. Vast numbers, however, regularly migrate farther north on the approach of spring. During their residence here in winter, they frequent the marshes, and the various creeks and inlets with which those extensive flats are intersected. Their principle food consists of those minute snail shells so abundant in the marshes. They occasionally visit the sandy beach in search of small bivalves, and, on these occasions, sometimes cover whole acres with their numbers. They roost at night in the shallow ponds, in the middle of the salt marsh, particularly on islands, where many are caught by the foxes. They are extremely shy during the day; and, on the most distant report of a musket, rise from every quarter of the marsh in prodigious numbers, dispersing in every direction. In calm weather they fly high, beyond the reach of shot; but when the wind blows hard, and the gunner conceals himself among the salt grass, in a place over which they usually fly, they are shot down in great numbers; their flight being then low. Geese, Brant, and Black Duck, are the common game of all our gunners along this part of the coast during the winter; but there are at least ten Black Ducks for one Goose or Brant, and probably many more. Their voice resembles that of the Duck and Mallard; but their flesh is greatly inferior, owing to the nature of their food. They are, however, large, heavy-bodied Ducks, and generally esteemed.

“I cannot discover that this species is found in any of the remote northern parts of our continent; and this is probably the cause why it is altogether unknown in Europe. It is abundant from Florida to New England; but is not enumerated among the birds of Hudson's Bay, or Greenland. Its chief residence is on the sea-coast, though it also makes extensive excursions up the tide waters of our rivers. Like the Mallard, they rarely dive for food, but swim and fly with great velocity.”

The specific name is derived from the Latin (*obscurus*), blackish or dark coloured.

The following is the technical description given by AUDUBON:—

Anas obscura, GMEI. Dusky Duck.

Tail much rounded, of eighteen acute feathers, none of which are recurved; bill yellowish-green; feet orange-red, the webs dusky; upper part of head glossy brownish black, the feathers margined with light brown; sides of head and a band over the eye light greyish-brown, with longitudinal dusky streaks; general colour blackish-brown, a little paler beneath, all the feathers margined with pale reddish-brown; wing-coverts greyish-dusky, with a faint tinge of green; ends of secondary coverts velvet black; primaries and their coverts blackish-brown; secondaries

darker; speculum green, blue violet, or amethyst-purple, bounded by velvet-black, the feathers also tipped with a narrow line of white; under surface of wing and axillaries white. Female more brown, with the speculum similar, but without the white terminal line.

Male, 24½, 38½. Female, 22, 34½.

Breeds in Texas, westward, and throughout the United States, British Provinces, and Labrador. Columbia River. Common in autumn and spring along the Middle Atlantic Districts. Abundant in the Southern and Western States, in winter.

Dusky Duck, *Anas obscura*, WILS. Amer. Orn. v. viii. p. 141.

Anas obscura, BONAP. Syn. p. 384.

Dusky Duck, *Anas obscura*, NUTT. Man. v. ii. p. 392.

Dusky Duck, *Anas obscura*, AUD. Orn. Biog. v. iv. p. 15.

ARTICLE XXIII.—On the Wood Duck, (*Anas sponsa*.)

ANAS SPONSA, THE WOOD DUCK, OR SUMMER DUCK.

SPECIFIC CHARACTERS.—*The most striking distinctive characters of the male of this species are: the upper part of the head and long pendulous crest deep bronze green, with white stripes; the throat pure white; breast reddish purple, spangled with small triangular white spots; belly white; back brownish black, a white crescent before the wings on either side; the white of the neck curving up towards the eye. Female, head dusky and very slightly crested; throat white; breast and abdomen white; back dark brown. Male, 20½-28; Female, 19½. Breeds throughout United States and British Provinces, to the Hudson's Bay Territories.*

The Wood Duck is remarkable among the swimming birds from the circumstance of its leading a partly arboreal life, perching upon trees, and thus approaching in habit the numerous feathered tribes classed in the order Insessores. There are only a few ducks known that have this habit, and it is said the greater proportion of them are confined to India. The subject of the present article is the only perching duck known to inhabit Canada. All the birds of this group of the Natatores have exceedingly beautiful and splendid plumage, and are particularly distinguished by a long pendulous crest of feathers arising from the posterior portion of the head and running down the back of the neck. Mr. LERT informs us "that our species makes its appearance here about the 5th of April, and remains until the latter end of October. It breeds in this country, building its nest in a hollow tree, to which the same bird will return year after year.

"This bird derives its name from the latter circumstance, as well as from its habit of perching on the branches of trees. This peculiarity is noticeable at the breeding season more than at any other time. Wood ducks are very seldom seen on trees in the fall of the year.

"The male bird of this species is the most beautiful of the whole tribe of Ducks. In a preserved state it is generally to be found among the ornamental curiosities of museums. The female possesses none of the elegant

plumage of the male, being simply of a dark brown color on the back and wings, with the breast white. She has, however, the tongue all to herself, possessing the loudest voice of any duck known in Canada.

“Wood Ducks in their habits are very similar to the Black Ducks.— They feed close to the shore, in shallow water, and may often be seen on land in search of food, which consists of nuts, seeds, and small plants.

“They are not so wary or difficult to approach as the Black Duck or the Golden Eye, although they are constantly on the look out for danger.

“This species, in common with every other non-diving species, is very fond of wild rice. Large flocks resort to the rice field to be found at different places on the Ottawa river, when they are shot on the wing as they arrive by sportsmen stationed in a canoe or on a Muskrat-house. The first flocks commonly make their appearance at the rice between sundown and dusk, and flock after flock continue to arrive until midnight. On a clear moonlight night, good sport may be had shooting them as they fly in. Having fed throughout the night, the great body of the birds leave the rice field before daylight to fly to their usual places of resort for many miles around, those remaining about the place during the day which have been hatched in the vicinity.

“Although the wood duck never dives when feeding, it is a cunning and active diver when wounded. It is a fact well known to sportsmen acquainted with the habits of ducks that frequently, when mortally wounded, this duck will dive and seize with its bill a weed growing at the bottom of the river, to which it may be found in shallow water, firmly attached after death.

“The female Wood Duck, shortly after hatching her young, conveys them from the height where her nest is built to the ground, by seizing them in her bill. The young, as do the young of every other species, when pursued or alarmed, will dive and immediately conceal themselves in hiding places, where they remain till the danger is over, which they are made aware of by the voice of the parent bird calling them together again.

“In the moulting season the male bird loses his fine variegated tuft, but he may still be distinguished from the female by the colors of his bill and the well marked outlines of the brilliant hues peculiar to his head.”

The following are some of Wilson's remarks :—“It is familiarly known in every quarter of the United States, from Florida to Lake Ontario, in the neighborhood of which latter place I have myself met with it in October.— It rarely visits the sea-shore, or salt marshes, its favorite haunts being the solitary, deep, and muddy creeks, ponds and mill-dams of the interior, making its nest frequently in old, hollow trees that overhang the water.

“The Summer Duck is equally well known in Mexico and many of the West India Islands. During the whole of our winters, they are occasionally seen in the States south of the Potomac. On the 10th of January, I met with two on a creek near Petersburg, in Virginia. In the more northern districts, however, they are migratory. In Pennsylvania, the female usually begins to lay late in April or early in May. Instances have been known where the nest was constructed of a few sticks laid in a fork of the branches ;

usually, however the inside of a hollow tree is selected for this purpose. On the 18th of May I visited a tree containing the nest of a Summer Duck, on the banks of Tuckahoe River, New Jersey. It was an old, grotesque white oak, whose top had been torn off by a storm. It stood on the declivity of the bank, about twenty yards from the water. In this hollow and broken top, and about six feet down, on the soft, decayed wood, lay thirteen eggs, snugly covered with down, doubtless taken from the breast of the bird.— These eggs were of an exact oval shape, less than those of a Hen, the surface exceedingly fine grained, and of the highest polish, and slightly yellowish, greatly resembling old, polished ivory. The egg measured two inches and an eighth by one inch and a half. On breaking one of them, the young bird was found to be nearly hatched, but dead, as neither of the parents had been observed about the tree during the three or four days preceding, and were conjectured to have been shot.

“This tree had been occupied, probably by the same pair, for four successive years, in breeding time; the person who gave me the information, and whose house was within twenty or thirty yards of the tree, said that he had seen the female, the spring preceding, carry down thirteen young, one by one, in less than ten minutes. She caught them in her bill by the wing or back of the neck, and landed them safely at the foot of the tree, whence she afterwards led them to the water. Under this same tree, at the time I visited it, a large sloop lay on the stocks, nearly finished; the deck was not more than twelve feet distant from the nest, yet notwithstanding the presence and noise of the workmen, the Ducks would not abandon their old breeding place, but continued to pass out and in, as if no person had been near. The male usually perched on an adjoining limb, and kept watch while the female was laying, and also often while she was sitting. A tame Goose had chosen a hollow space at the root of the same tree, to lay and hatch her young in.

“The Summer Duck seldom flies in flocks of more than three or four individuals together, and most commonly in pairs, or singly. The common note of the drake is *peet, peet*; but when, standing sentinel, if he sees danger, he makes a noise not unlike the crowing of a young cock, *oe eek! oe eek!* Their food consists principally of acorns, seeds of wild oats, and insects.— Their flesh is inferior to that of the Blue-winged Teal. They are frequent in the markets of Philadelphia.

“Among other gaudy feathers with which the Indians ornament the calumet or pipe of peace, the skin of the head and neck of the Summer Duck is frequently seen covering the stem.

“This beautiful bird has often been tamed, and soon becomes so familiar as to permit one to stroke its back with the hand. I have seen individuals so tamed, in various parts of the Union. Captain Boyer, collector of the port of Havre-de-Grace, informs me, that about forty years ago, a Mr. Nathan Nichols, who lived on the west side of Gunpowder Creek, had a whole yard swarming with Summer Ducks, which he had tamed and completely domesticated, so that they bred and were as familiar as any other tame fowls; that he (Captain Boyer) himself saw them in that state, but does not know what

became of them. Latham says, that they are often kept in European menageries, and will breed there."

The specific name appears to be Latin, (*Sponsa*) a bride. We shall conclude this notice of the Wood Duck with the very full description given in Audubon's Synopsis, page 280 :—

Anas Sponsa, LINN. Wood Duck.—Summer Duck.

Male with the feathers of the head and upper and hind part of neck elongated and incurved, inner secondaries very broad, tail much rounded, of sixteen feathers; bill bright red at the base, yellow on the sides, ridge and unguis black; feet greenish-yellow; upper part of head and loreal space deep green; below the eye a patch of dark purple, behind it a larger patch of the same colour; sides of neck, its hind part under the crest, and the middle all round, very dark purple; a narrow line along the base of the upper mandible and over the eye, meeting on the occiput, pure white, as are some of the feathers of the crest; another from behind the eye meeting below the occiput, and including several of the lower elongated feathers; throat pure white, with a process on each side a little beyond the eye, and another nearly half-way down the neck; sides of the neck and its lower part anteriorly reddish-purple, each feather on the latter with a triangular white tip; middle of the neck behind, back and rump, very dark reddish-brown, the latter deeper, and tinged with green; upper tail-coverts and tail greenish-black; some of the lateral tail-coverts dull reddish-purple, a few on either side with their central filaments light red; smaller wing coverts, alula, and primaries dull greyish brown, most of the latter, with part of the outer web greyish-white, and the inner toward the end darker and glossed with green; secondary quills tipped with white, the outer webs green with purple reflections, those of the inner secondaries and scapulars velvet-black, their inner webs partially glossed and changing to green; the broad feathers anterior to the wings white, terminated with black; breast and abdomen greyish-white; feathers under the wings yellowish grey, minutely undulated with black, and tipped with a white and two black bands; lower wing-coverts and axillar feathers white, barred with greyish-brown; lower tail-coverts dull greyish-brown. Female with the bill blackish-brown, the feet dull green; upper part of head dusky glossed with green, sides of head and neck, with hind part of latter, light brownish-grey; throat white, but without the lateral processes; fore part of neck below and sides light yellowish-brown, mottled with dark greyish-brown, as are the sides under the wings; breast and abdomen white, the former spotted with brown; hind neck, back, and rump dark brown, glossed with green and purple; wings as in the male, but the speculum less, and the secondaries externally faint reddish-purple, the velvet-black of the male diminished to a few narrow markings; tail dark brown, glossed with green; lower tail-coverts pale greyish-brown, mottled with white.

Male, 20½, 28. *Female*, 19½.

Breeds throughout the country from Texas to the Columbia, and eastward to Nova Scotia. Fur Countries. Accumulates in the Southern Districts in winter.

Summer Duck or Wood Duck, *Anas sponsa*, SWAINS. & RICH. F. BOR. Amer. v. viii. p. 97.

Dendronessa sponsa, Summer Duck, SWAINS & RICH. F. BOR. Amer. v. ii., p. 446.

Summer or Wood Duck, *Anas sponsa*, NUTT. Man. v. ii. p. 394.

Wood Duck, *Anas sponsa*, AUD. Orn. Biog. v. iii. p. 52; v. v. p. 618.

ARTICLE XXIV.—On the Green-winged Teal, (*Anas Carolinensis*.)

ANAS CAROLINENSIS, (Step) AMERICAN GREEN-WINGED TEAL.

SPECIFIC CHARACTERS.—Male, head and upper part of neck chestnut red; a broad green band from the eye down the back of the neck; upper part and flank crossed by crowded blackish, brown and white undulating lines; mirror green, margined above and below with black, and before and behind with white; bill black; feet light bluish grey; the head has a short crest. Female, greyish, mottled with dark brown. Male, $14\frac{3}{4}$ 24; Female, $13\frac{3}{4}$ 22 $\frac{1}{2}$. Inhabits United States and British Territories—Canada in Spring and Autumn; Winter in Southern States.

Wilson was of opinion that the American Green-winged Teal should be considered identical with the European species. We believe, however, that most Naturalists are now satisfied with the opposite view, and that our bird is sufficiently well marked to be classified as distinct from that of the eastern continent. The male in full plumage is a very neat and even beautiful bird, while the female is clothed with more sober and matronly colours. They make their appearance in Canada in the month of April and the beginning of May, being then on their route to the northern territories, where they remain during the summer to rear their young. In the autumn they again return, their numbers being greatly increased. They are not often seen in the summer in Canada. They frequent the ponds, marshes, inundated lands, and reedy shores of creeks and rivers. They fly about and feed during the night, associating often with other species of Ducks. Mr. LETT says:—"Their flight is exceedingly rapid and irregular, and their mode of alighting sudden and abrupt. They are also very easily approached, and do not exhibit so much alarm at the proximity of man as many of the larger species. Their note is a short hoarse *quack*, which, however, is seldom heard, except when they are suddenly alarmed and put to flight. It is very doubtful whether they breed in this part of Canada or not; it is certain, however, that young broods of this species are never seen here. The Green-winged Teal resorts chiefly to inundated land in the spring, and to shallows near the shores, and adjacent to rapids in the autumn. They do not dive when feeding, but when wounded are almost equal to the Golden Eye or Loon at diving."

Wilson's description of the Green-winged Teal is as follows:—

"The Green-winged Teal is fifteen inches in length, and twenty-four inches in extent; bill, black; irides, pale brown; lower eyelid, whitish; head, glossy reddish chestnut; from the eye backwards to the nape runs a broad band of rich silky green, edged above and below by a fine line of brownish white; the plumage of the nape ends in a kind of pendent crest; chin, blackish; below the chestnut, the neck, for three quarters of an inch,

is white, beautifully crossed with circular, undulating lines of black; back, scapulars, and sides of the breast, white, thickly crossed in the same manner; breast elegantly marked with roundish or heart-shaped spots of black, on a pale vinaceous ground, variegated with lighter tints; belly, white; sides, waved with undulating lines; lower part of the vent-feathers, black; sides of the same, brownish white, or pale reddish cream; lesser wing-coverts, brown ash; greater, tipped with reddish cream; the first five secondaries, deep velvety black, the next five resplendent green, forming the speculum or beauty spot, which is bounded above by pale buff, below by white, and on each side by deep black; primaries, ashy brown; tail, pointed, eighteen feathers, dark drab; legs and feet, flesh colored. In some, a few circular touches of white appear on the breast near the shoulder of the wing. The windpipe has a small, bony labyrinth where it separates into the lungs; the intestines measure three feet six inches, and are very small and tender.

“The female wants the chestnut bay on the head, and band of rich green through the eye, these parts being dusky white, speckled with black; the breast is grey brown, thickly sprinkled with blackish, or dark brown; the back, dark brown, waved with broad lines of brownish white; wing, nearly the same as in the male.

“This species is said to breed at Hudson’s Bay, and to have from five to seven young at a time. In France, it remains throughout the year, and builds in April, among the rushes on the edges of the ponds. It has been lately discovered to breed, also, in England, in the mosses about Carlisle.— It is not known to breed in any part of the United States. The Teal is found in the north of Europe as far as Iceland, and also inhabits the Caspian Sea to the south; extends likewise to China, having been recognised by Latham among some fine drawings of the birds of that country.”

The latter remarks of Wilson are founded upon his supposition that our species and the European Teal (*Anas crecca*) are the same species.

ARTICLE XXV.—*On the Blue-winged Teal, (Anas discors.)*

ANAS DISCORS, (Linn) BLUE-WINGED TEAL.

SPECIFIC CHARACTERS.—*Male, head blackish, glossed with green and purple, a crescent of white in front of the eye; back brownish black, with semi-oval spots of brownish white; sides and belly greyish brown, barred and spotted with dusky; some of the wing coverts blue; general appearance greyish; speculum green; bill bluish black; feet dull yellow. Female, head dusky slate, and without the purple and violet of the male. Male, 16-31 $\frac{1}{4}$; Female, 15-24. Inhabits United States and British Territories. Breeds in the north.*

The blue-winged teal is seldom seen here until late in the season, and then only in limited numbers. It is nearly as large as the wood-duck, although much shorter in the body and neck. They are generally seen in

flocks of perhaps from eight to twelve, feeding in low marshy ground upon the shores of rivers. Their flight is very rapid, like that of a pigeon, and when about to alight they drop down suddenly, like a snipe or wood-cock. The flesh of this species is excellent, and may be considered quite a delicacy for the table, compared with many others of the duck species.

This bird, like the black duck, never dives in feeding, but when wounded, like the latter, dives with great rapidity and cunning.

The blue-winged Teal is comparatively easy to approach, consequently it falls an easy sacrifice to the gun of the sportsman. The male and female bird differ but little in plumage, both being of a light grey color and marked with a blue spot on the wing. In shape this species is precisely similar to the black duck, and in habit much the same, both delighting to feed around the muddy shores of rivers. This species does not breed in this part of Canada. They generally make their first appearance here about the month of July, and they are then in excellent condition.

The above are Mr. Jett's observations on this bird, and the following is the description given by Wilson, in his American Ornithology:—

“The blue-winged Teal is the first of its tribe that returns to us in the autumn from its breeding place in the north. They are usually seen early in September, along the shores of the Delaware, where they sit on the mud close to the edge of the water, so crowded together that the gunners often kill great numbers at a single discharge. When a flock is discovered thus sitting and sunning themselves, the experienced gunner runs his batteau ashore at some distance below or above them, and getting out, pushes her before him over the slippery mud, concealing himself all the while behind her; by this method he can sometimes approach within twenty yards of the flock, among which he generally makes great slaughter. They fly rapidly, and, when they alight, drop down suddenly, like the Snipe or Woodcock, among the reeds or on the mud. They feed chiefly on vegetable food, and are eagerly fond of the seeds of the reeds or wild oats. Their flesh is excellent, and, after their residence for a short time among the reeds, become very fat. As the first frosts comes on, they proceed to the south, being a delicate bird, very susceptible of cold. They abound in the inundated rice-fields, in the Southern States, where vast numbers are taken in traps placed on small, dry eminences, that here and there rise above the water. These places are strewed with rice, and by the common contrivance called a *figure four*, they are caught alive in hollow traps. In the month of April they pass through Pennsylvania for the north, but make little stay at that season. I have observed them numerous on the Hudson opposite to the Katskill Mountains. They rarely visit the sea-shore.

“This species measures about fourteen inches in length, and twenty-two inches in extent; the bill is long in proportion, and of a dark dusky slate; the front and upper part of the head are black; from the eye to the chin is a large crescent of white; the rest of the head and half the neck are of a dark slate, richly glossed with green and violet; remainder of the neck and breast is black or dusky, thickly marked with semicircles

of brownish white, elegantly intersected with each other; belly, pale brown, barred with dusky, in narrow lines; sides and vent, the same tint, spotted with oval marks of dusky; flanks elegantly waved with large semicircles of pale brown; sides of the vent, pure white; under tail-coverts, black; back, deep brownish black, each feather waved with large semi-ovals of brownish white; lesser wing coverts, a bright light blue; primaries, dusky brown; secondaries, black; speculum, or beauty spot, rich green; tertials edged with black or light blue, and streaked down their middle with white; the tail, which is pointed, extends two inches beyond the wings; legs and feet, yellow, the latter very small; the two crescents of white, before the eyes, meet on the throat.

“The female differs in having the head and neck of a dull dusky slate, instead of the rich violet of the male; the hind head is also whitish; the wavings on the back and lower parts, more indistinct; wing, nearly the same in both.”

The specific name is Latin, (*Discors*.) harsh or jarring, probably in allusion to the hoarse quack of this species.

ARTICLE XXVI.—*On the Mallard, (Anas boschas.)*

ANAS BOSCHAS, (Linn.) THE MALLARD.

SPECIFIC CHARACTERS.—*Male, head and neck deep green, a white ring round the neck; breast, brownish chestnut; back, brownish black; belly and sides, pale grey, crossed by fine undulating lines of darker colour; speculum, purple and green; bill, greenish yellow; feet, orange red; rump, black, green, and purplish blue; some of the tail feathers curled; general appearance, similar to that of the tame drake. Female, yellowish, spotted with dusky brown; male, 24, 36; female, 22. Inhabits and breeds throughout North America.*

This fine bird so much resembles certain varieties of the common domesticated species, that the sportsman, when seen in possession of them, generally brings himself under the suspicion of having committed a depredation upon some neighbouring farm yard. In the part of Canada where we are writing, in the valley of the Ottawa, they are not so common as many other species. They are only rarely seen in our immediate vicinity. Sir John Richardson says they abound in the Hudson's Bay Territories, breeding in the woody district up to their most northern limits, in lat. 68°. It is there migratory across the continent, common on the Saskatchewan in summer, but spends the winter in the South. Wilson thus describes the species:—

“The Mallard, or Common Wild-Drake, is so universally known as scarcely to require a description. It measures twenty-four inches in length, by three feet in extent, and weighs upwards of two pounds and a half; the bill is greenish yellow; irides hazel; head, and part of neck, deep glossy

changeable green, ending in a narrow collar of white ; the rest of the neck and breast are of a dark purplish chestnut ; lesser wing-coverts, brown ash ; greater, crossed near the extremities with a band of white, and tipped with another of deep velvety black ; below this lies the speculum, or beauty spot, of a rich a splendid light purple, with green and violet reflections, bounded on every side with black ; quills, pale brownish ash ; back, brown, skirted with paler ; scapulars, whitish, crossed with fine, undulating lines of black ; rump and tail-coverts, black, glossed with green ; tertials, very broad, and pointed at the ends ; tail, consisting of eighteen feathers, whitish, centred with brown ash, the four middle ones excepted, which are narrow, black, glossed with violet, remarkably concave, and curled upwards to a complete circle ; belly and sides, a fine gray, crossed by an infinite number of fine, waving lines, stronger and more deeply marked as they approach the vent ; legs and feet, orange red.

“ The female has the plumage of the upper parts dark brown, broadly bordered with brownish yellow ; and the lower parts yellow ochre, spotted and streaked with deep brown ; the chin and throat, for about two inches, plain yellowish white ; wings, bill, and legs, nearly as in the male.

“ The windpipe of the male has a bony labyrinth, or bladder-like knob, puffing out from the left side. The intestines measures six feet, and are as wide as those of the Canvass-Back. The windpipe is of uniform diameter, until it enters the labyrinth.

“ This is the original stock of the common domesticated Duck, reclaimed, time immemorial, from a state of nature, and now become so serviceable to man. In many individuals, the general garb of the tame drake seems to have undergone little or no alteration ; but the stamp of slavery is strongly imprinted in his dull, indifferent eye and grovelling gait, while the lofty look, long, tapering neck, and uprightly action of the former bespeak his native spirit and independence.

“ The Common Wild Duck is found in every fresh-water lake and river of the United States in winter, but seldom frequents the sea-shores or salt marshes. Their summer residence is the north, the great nursery of this numerous genus. Instances have been known of some solitary pairs breeding here in autumn. In England these instances are more common. The nest is usually placed in the most solitary recess of the marsh, or bog, amidst coarse grass, reeds, and rushes, and generally contains from twelve to sixteen eggs, of a dull greenish white. The young are led about by the mother in the same manner as those of the Tame Duck, but with a superior caution, a cunning and watchful vigilance peculiar to her situation. The male attaches himself to one female, as among other birds in their native state, and is the guardian and protector of her and her feeble brood. The Mallard is numerous in the rice-fields of the Southern States during winter, many of the fields being covered with a few inches of water ; and, the scattered grains of the former harvest lying in abundance, the Ducks swim about, and feed at pleasure.

“ The flesh of the Common Wild Duck is in general and high estim-

tion; and the ingenuity of man, in every country where it frequents, has been employed in inventing stratagems to overreach these wary birds, and procure a delicacy for the table. To enumerate all these various contrivances would far exceed our limits; a few, however, of the most simple and effective, may be mentioned.

“ In some ponds frequented by these birds, five or six wooden figures, cut and painted so as to represent Ducks, and sunk, by pieces of lead nailed on their bottoms, so as to float at the usual depth on the surface, are anchored in a favorable position for being raked from a concealment of brush, &c., on shore. The appearance of these usually attracts passing flocks, which alight, and are shot down. Sometimes eight or ten of these painted wooden Ducks are fixed on a frame in various swimming postures, and secured to the bow of the gunner’s skiff, projecting before it in such a manner that the weight of the frame sinks the figures to their proper depth; the skiff is then dressed with sedge or coarse grass in an artful manner, as low as the water’s edge; and under cover of this, which appears like a party of Ducks, swimming by a small island, the gunner floats down sometimes to the very skirts of a whole congregated multitude, and pours in a destructive and repeated fire of shot among them. In winter, when detached pieces of ice are occasionally floating in the river, some of the gunners on the Delaware paint their whole skiff or canoe white, and, laying themselves flat at the bottom, with their hand over the side, silently managing a small paddle, direct it imperceptibly into or near a flock, before the Ducks have distinguished it from a floating mass of ice, and generally do great execution among them. A whole flock has sometimes been thus surprised asleep with their heads under their wings. On land another stratagem is sometimes practised with great success. A large, tight hogshead is sunk in the flat marsh, or mud, near the place where Ducks are accustomed to feed at low water, and where otherwise there is no shelter; the edges and top are artfully concealed with tufts of long, coarse grass, and reeds or serge. From within this the gunner, unseen and unsuspected, watches his collecting prey, and, when a sufficient number offers, sweeps them down with great effect. The mode of catching Wild Ducks, as practised in India, China, the Island of Ceylon, and some parts of South America, has been often described, and seems, if reliance may be placed on those accounts, only practicable in water of a certain depth. The sportsman, covering his head with a hollow wooden vessel, or calabash, pierced with holes to see through, wades into the water, keeping his head only above, and, thus disguised, moves in among the flock, which take the appearance to be a mere floating calabash, while, suddenly pulling them under by the legs, he fastens them to his girdle, and thus takes as many as he can conveniently stow away, without in the least alarming the rest. They are also taken with snares made of horse hair, or with hooks baited with small pieces of sheep’s lights, which, floating on the surface, are swallowed by the Ducks, and with them the hooks. They are also approached under cover of a stalking horse, or a figure formed of thin boards, or other proper materials, and painted so as to represent a horse or ox.”

In England this is one of the species captured in thousands, in the fens, by means of decoys. It is spread all over Europe and North America, and it is said to exist even in India, and like most of the prolific and widely extended species, subject to great variations of form and plumage in domestication.

The specific name is Greek, (*Boschas*), a wild duck.

ARTICLE XXVII.—*On a Sea-Gull shot at Ottawa.*

LARUS ARGENTATUS, (Brunnich,) HERRING OR SILVERY GULL.

On the 15th of April inst., Mr. W. H. Baldwin, of the ALBION HOTEL, shot a fine gull near this city, which appears to us to be the common species described by Ornithologists under the name of LARUS ARGENTATUS, the Herring or Silvery Gull. The bird had one of the wings broken by the shot, but it appears to be otherwise uninjured. Mr. Baldwin has amputated the broken wing, and his patient seems to feel very little inconvenience by the loss. It is a very beautiful bird, with pure snow-white plumage, except the upper part of the wings and back, which are greyish blue. It is exceedingly tame, suffering itself to be handled and caressed without exhibiting any alarm, and feeding upon the small fish and bread provided for it with as much nonchalance as if it were feasting in freedom on its native waters. It will eat almost anything given to it, but prefers the small fresh fish. It exhibits no disposition to escape, and is not confined otherwise than being shut up in an out-house, where it runs about at will, and when turned out in the yard endeavours to return to the building. These facts seem to prove that this gull can be easily domesticated after the first terror arising from the contact with man has been passed through.

The Gulls are web-footed, but their legs are longer than those of the Ducks, and nearer the centre of the body, so that these birds are good walkers, approaching in this respect the appearance of waders. Some of this family, such as the Petrels, "seem even to employ their feet in their own element as if on land, walking as it were upon the surface of the waters." They are also characterised by the strength and expansiveness of their wings, with the aid of which they traverse immeasurable tracts of the ocean in search of food, and support their flight at great distances from the land, seldom having recourse to their powers of swimming. They are a numerous tribe, and spread over the whole world of waters in every clime. They are omnivorous, many are of large size, and all are voracious devourers of fish, and of every marine animal, whether dead or alive, which is cast upon the shore. The Herring or Silvery Gull is common about our great lakes and rivers, most numerous in the spring and autumn, but although apparently always upon the wing and flying about for hours in the same place, does not usually approach within gun shot, and specimens are therefore not often procured. We give below the technical description of the species from Audubon's Synopsis. Mr. Baldwin's specimen differs somewhat, and still we think it the same.—

Instead of silvery white, the iris is yellowish white; the feet are greyish flesh colour; the patch of white on the first primary is only an inch in length on each web, and there is no circular patch on the inner web of the second; but, as Audubon says, "the terminal markings vary," perhaps these differences are of little importance.

The technical names of this species are Latin, *Larus*, a gull; *argentatus*, silvery.

Audubon thus describes the species:—

Bill robust, compressed, gamboge-yellow, with an orange-red patch toward the end of the lower mandible; iris silvery-white; feet flesh-coloured; head, neck, lower parts, rump, and tail, pure white; back and wings, light greyish blue; edges of wing and extremities of quills, white; the first six quills brownish black towards the end, that colour including the outer webs and the greater part of the inner of the first two, and on the rest gradually diminishing, so as on the sixth merely to form a bar; the first quill with a patch of white about an inch and a half long on both webs near the end, the second with a circular patch on the inner web; the tips of all white. The terminal markings of the outer quills vary. Young with the bill brownish black, paler at the base of the lower mandible, feet purplish flesh colour; general colour of plumage, light purplish grey, the upper part of the head darker, the lower parts mottled with pale yellowish grey; feathers of upper parts and upper-tail coverts, irregularly edged and barred with greyish white; primary quills greyish black, terminally margined with whitish; tail of the same colour, its base and the outer webs of the lateral feathers irregularly mottled with whitish, the tips brownish white.

Male, 23, 53. *Young*, in winter, 18½, 51.

Abundant in autumn, winter, and early spring, from Texas along the whole Atlantic coast of Newfoundland. Breeds from the Bay of Fundy to Melville Island. Common in autumn on the Great Lakes, the Ohio, and Mississippi.

Larus argentatus, BONAP. Syn. p. 360.

Herring Gull, *Larus argentatus*, NUTT. Man. v. ii. p. 304.

Herring Gull, *Larus argentatus*, AUD. Orn. Biog. v. iii. p. 588; v. v. p. 638.

THE CANADIAN INSTITUTE, GEOLOGICAL SURVEY, &c.—The Journal of the Canadian Institute is now conducted by an able editorial corps, composed principally of the Professors of the University and Colleges at Toronto, while it is, at the same time, open to communications from the numerous members of the Society, upon any of the sciences to which its pages are devoted. The March number contains many articles, reviews, scientific and literary notes, all of them of great value.

The Canadian Institute is doing a vast deal of good in calling into activity throughout the country, energies which we have no hesitation in stating would have long slumbered but for that Institution. The same may be said of the Geological Survey. The development of the resources of Canada, the working out of its physical structure, and the exploration of its mineral treasures are not its only services. It has excited curiosity and a desire to acquire information which must lead to important educational results. Reputation abroad,—good name to nations is of as much value as it is to individuals. To be known as a country where the arts and sciences are vigorously cultivated, is to have a good repute. In the department of which we are now speaking, there is much remaining to be done, both by labour and science, and it will be productive of the greatest injury to Canada not to carry out the Survey to its completion.

ERRATA.—On page 134, 30th line from the top, for "Frias," read "Trias."
On page 142, for "migratorious," read "migratorius."