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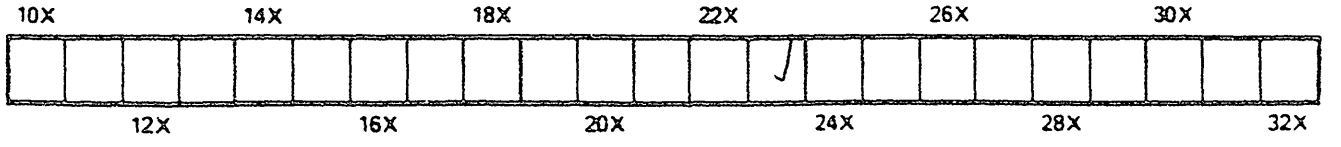


THE

CANADIAN

Naturalist & Geologist,

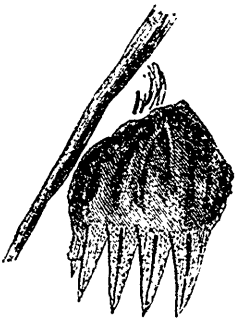
AND PROCEEDINGS OF THE

NATURAL HISTORY SOCIETY

OF MONTREAL.

CONDUCTED BY A COMMITTEE OF THE NATURAL HISTORY SOCIETY.

VOL. VI. FEBRUARY, 1861. No. 1.



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CANADIAN NATURALIST.

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

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THE NATURAL HISTORY SOCIETY.

THE

CANADIAN

NATURALIST AND GEOLOGIST.

VOL. VI. FEBRUARY, 1861. No. 1.

ARTICLE I.—*On the* Cornus florida *of the United States.* By George S. Blackie, A. M., M. D., and Professor of Botany and Natural History, University of Nashville, Tennessee, U.S., Honorary Member of the Botanical Society of Canada.

[*Read before the Botanical Society by Professor Williamsor, LL.D., Kingston, 11th January,* 1861.]

Common throughout all our forests, conspicuous in spring time by its festoons of large white blossoms, and equally so during the fall months from its clusters of scarlet berries, a handsome little tree usually about 15 to 30 feet high, is the *Cornus florida* L. of the United States. I have brought this plant to your notice for no particular reason, but that it this morning attracted my attention, as I walked in the neighbourhood of my home, and I conceive that much service may be done to the existing state of the botanical knowledge of our country, should each member of the society take up, meeting after meeting, some individual plant, no matter how common, and state all that he knows of that plant, whether such information be gleaned from his own studies or from those of others. On my first visit to the United States, one of the first objects which attracted my attention on travelling down the Mississippi, from the snows of Canada to the balmy spring of Louisiana, was this plant, and its extreme beauty, con-

trasted with the gloominess of the scenery from which I had just emerged, made so strong an impression on me, that I have ever since regarded the plant with a peculiar interest.

Cornus florida is probably the most generally distributed species of its genus in our country. In this genus, which is one of the family of *Cornaceæ*, there are about twenty species, of which America has, north of Mexico, eleven; two are peculiar to Mexico; three are found in Nepaul; two in Japan; two are found in both Europe and Asia, and one is found in the north of both hemispheres. They are all shrubs, with entire, deciduous leaves, covered with appressed hairs, the calyx four toothed, minute, adhering to the ovary; the petals four, distinct, oblong, inserted with the calyx into an epigynous disk, drupes baccate, flowers in cymes. In this State (Tennessee) we have at least five species; *C. paniculata, C. stricta, C. asperifolia, C. sericea*, and the subject of my present paper. In addition to these, in the north there are the species *C. Canadensis, C. circinnata, C. alba, C. alternifolia*, and *C. sanguinea*. The property of the bark of all these is very bitter and tonic. Some of them have underground stems, which send up branches dying annually down, others again have true permanent stems, the wood of which is excessively hard, a fact which has given rise to the name, from the Latin *Cornu*, a horn, the wood being believed to be as hard and as durable as horn. Hence the ancient Romans constructed spear-shafts and other warlike instruments from it, and Virgil alluded to it as *bona belli cornus*. The wood of *C. florida* is not only remarkable for its hardness, but for its extremely fine texture.

Cornus florida, the flowering dogwood, is the most beautiful and showy plant of its genus. It is a round-headed small tree, usually fifteen or twenty feet high, but often reaching a height of twenty-five or thirty feet, and its stem a diameter of eight or nine inches. The new shoots are of grayish green, covered with down, those of the previous year are purple with slight rings, afterwards changing to gray and streaked with brown. The stem is rough, with short broken ridges, between which the bark is often divided into regular plates. The branches are numerous, spreading, and disposed with regularity, sometimes opposite, sometimes arising by fours. The leaves are three inches long, opposite, oval, entire, acuminated, and, at the base, abruptly tapering to a short channelled footstalk. Smooth on their upper surface, their lower is whitish, with hairs along the mid-ribs and veins, and a few

scattered ones between, the upper surfaces having also numerous conspicuous ridges. The flowers are placed on the ends of the branches, supported by a club-shaped footstalk. They are extremely small, and aggregated together in numbers of twelve or more in a head, surrounded by a showy involucre, three or four inches in length, and which is supposed by the non-scientific to be the flower. The flowers themselves are of a greenish yellow colour, but the four large obcordate leaves of the involucre are white, and sometimes tinged with violet. The outer extremity of each is notched as if from injury and this notch is purple or rose coloured. The calyx is extremely small. The petals and stamens are each four in number. There is one pistil with a filiform style nearly as long as the corolla. The fruit is a group of oblong, oval, shining, bright scarlet berries, crowned with the remnant of the calyx. They appear placed in the fork of two branches, which arises from the fact that while the flowers are terminal, yet ere the fruit is perfected, the two branchlets for the flowers of the succeeding year are developed and grow up on each side. These berries ripen here about July or August, and are eagerly devoured, despite their bitterness, by birds in the winter season. In Louisiana, the *C. florida* flowers in February, in our vicinity in April and May, and farther north in June and July. It is in bloom for a fortnight, during which time the Indian farmers say, Indian corn should be planted. The plant is of low growth, and has a hard, heavy, solid wood, of a close texture, and susceptible of a high polish. It is often called Boxwood, and used as a substitute for it in the manufacture of handles of chisels, hammers, and such tools, for the cogs of wheels, teeth of harrows, spoons, &c. Soon after the fruit commences to ripen the leaves begin to change their colour, turning to a purple and then to a rich crimson or purple colour, and a bright russet beneath, forming one of the most beautiful objects of our forests during the fall months. It is figured in Botanical Magazine, t. 526.

Chemical analysis shows that the bark of the root, stem, and branches, which are bitter, astringent, and aromatic, contain in different proportions, the same substances as are found in *Cinchona*, except that there is more gum, mucilage, gallic acid, and extractive matter, and less resin, quinine and tannin. The principle obtained from it is called *Cornine*, and its salts have all the properties of these of quinine, though not so strongly marked. The principle is also difficult to obtain in any quantity. The extract of Dog-

wood, while inferior and less stringent than the best cinchona, is yet superior to the inferior kinds. This extract contains all the tonic properties, while the simple resin is merely a stimulant. Professor Barton says "that it may be asserted with entire safety that as yet there has not been discovered within the limits of the United States any vegetable so effectually to answer the purpose of Peruvian bark, in the management of intermittent fevers as the *Cornus florida.*" It may be looked upon as our best native tonic. In some respects, however, it differs from quinine, as the powdered bark quickens the pulse, and sometimes produces violent pain in the bowels. On this account the preparations employed are the sulphate of cornine and the extract. Dr. O'Keefe of Augusta, Georgia, has prepared a valuable alcoholic and watery extract of the bark, which seems to possess all its medicinal properties. (See Trans. of Amer. Med. Association, vol. II., p. 671.) This may be used in intermittent and remittent fevers, also in typhus and all febrile disorders. In cases of debility, Dogwood is a valuable corroborant, for which purpose it may be combined with Colombo, Gentian, Chamomile, or Seneca root. Country people often use it as a decoction, or chew the twigs as a prophylactic against fevers. Drunkards sometimes employ a tincture of the berries to restore the tone of the stomach, and combat the pains of dyspepsia. Many have recommended a decoction of equal parts of Dogwood and Wild Cherry barks, as a remedy in dyspepsia, and the debility in convalescence from fever. The flowers have similar properties, and a warm infusion of them was often employed by the Indians in cases of chills and indigestion. They named the plant *Mon-hx-can-ni-min-schi.* The powdered bark of the plant makes one of the best tooth powders with which I am acquainted, as it preserves the gums hard and sound, and at the same time, renders the teeth extremely white. Rubbing the fresh twigs on the teeth has this effect, and the Creoles of the West Indies, the pearly whiteness of whose teeth is universally acknowledged, use another species in this way.

There are yet other uses to which Dogwood has been put. A sort of inferior ink may be made with the bark, using it instead of galls. A warm decoction of the bark with sassafras is a valuable wash for foul ulcers, and in veterinary medicine a decoction of the bark has been used with very good effect in a malignant disease called yellow water, Canada distemper, &c., very fatal among horses.

Thus I have endeavoured to place before you a sketch of one of the denizens of our Tennessee woods, and if my effort has at all interested you, it will give me pleasure to repeat it should you call on me on another occasion.

[Prof. Williamson, in remarking upon the above paper, stated to the meeting that he had not observed the *Cornus florida* in the immediate neighbourhood of Kingston, but he had seen it in the Niagara district.

Prof. Lawson exhibited specimens of the plant from various parts of the United States, and alluded to its wide range, but apparently southern tendency. It is no doubt correctly regarded as a Canadian species; but it is absent from Prof. Barnston's list of the Holmes' herbarium, Montreal; from Mr. Billings' list of Prescott plants, and other accessible local lists, as well as from the various collections made in the neighbourhood of Kingston. It is not difficult to trace the distribution of so showy a plant, and it is to be hoped that Prof. Blackie's remarks will lead to the publication of Canadian localities.]

ARTICLE II.—*A popular Treatise on the Fur-bearing Animals of the Mackenzie River District.* By BERNARD ROGAN ROSS, C. T.

[*Presented to the Natural History Society of Montreal.*]

In submitting the following Treatise to the notice of the Natural History Society of Montreal, I will, previously to entering on my subject, mark out the extent of country to which only, my remarks apply.

A residence of thirteen years in this District, during the greatest part of which time I have been a not unsuccessful trapper, has afforded me many opportunities of observation upon the nature and habits of the various fur-bearing animals inhabiting these high northern latitudes. I have throughout studied accuracy rather than effect, and the style of my remarks is doubtless rather popular than scientific; yet the hope that my humble endeavours may perchance clear one doubtful point, or illustrate some new truth has lightened my labour, and will, if such should in reality happen, prove an ample recompense for my toil.

The boundaries of the Mackenzie River District may be considered to extend from Salt River, a tributary of the Slave to the Arctic Sea, and from 100° W. long. to the Rocky Mountains.

I cannot here omit mentioning the aid which I have received, in the scientific parts of the Treatise from the splendid, complete, and accurate work of Prof. Baird on North American Mammals. The general characteristics of Families are quoted verbation from his work.

Lynx, *Rafinesque.*

Gen. ch. Molars $\frac{3}{3}$-$\frac{3}{3}$ the small anterior premolar of Felis wanting. Tail considerably less than half the body, exclusive of the head and neck, generally not much longer than the head, and abruptly truncate at tip. Baird.

Lynx Canadensis, *Raf.*

Sp. ch. Size between that of a Fox and Wolf. Tail thickly furred, shorter than the head, and tipped with black. Paws densely covered with hair, and armed with strong claws. Color in winter, a silver grey on the back, paling towards the belly, which is sometimes white; a rufus undershade mixes with tints. The ears are pointed, not large, and tipped with a pencil of long black hairs. Whiskers generally white. Length from the tip of the nose to the tip of the tail about 3 feet. Average weight about 25 lbs.

This species is the largest of the North American Lynxes, and is the only one found in the Mackenzie River District. It is called by the "winterers" indifferently either Lynx Cat, Loup Cervier, or Pichen. In appearance it is rather formidable; its teeth are long and sharp, while its powerful claws and immense spring render it a dangerous opponent to any animal that it encounters. In its habits it is predatory. Hares and mice it devours with avidity; birds it pursues to the tops of the loftiest trees, and it even kills fish in their own element; while it has no objection to carrion, and, when pressed by hunger will even eat its own kind. Tales of the ferocity of this animal have been told by the early writers—of its attacking and mastering deer—but they are without foundation. It is a solitary beast, and I should consider its unaided strength perfectly incompetent for such a purpose.

In its motions, though very active, the Lynx is rather an ungainly animal. Its favourite pace is a succession of long leaps much in the manner of the American Hare (*Lepus Americanus*), which it also slightly resembles in shape. It is stupid, and easily caught. A sudden and loud cry from the hunter pursuing it is

sufficient to arrest its course for a time long enough to permit him to fire, and sometimes several shots are obtained at the same animal in this manner. It is easily killed, a not very heavy blow being sufficient to fracture its skull.

The colour of the fur varies much with the seasons. In winter the hair is thick, long, and silky. The grey markings are of a dark silver colour, while the rufus undershade is scarcely observable. In some specimens the dark stripe down the back would not disgrace a silver fox. In summer it wears a rusty look, the hair is short and thin; and there is more rufus and little of the silvery grey in the tints, while the skin is marked with black spots, which serve to distinguish a prime from a common fur, in trading with the Natives. These spots appear generally in April and disappear in November.

The Lynx is found all over this District, in greater or lesser numbers, wherever there are trees, even within the Arctic Circle. It is subject, like most of the other Fur Animals, to periodical migrations, which appear to occur with great regularity in periods of ten years, and which in its case depend on the Hare its principal food. One of the most curious of the idiosyncrasies of this animal is its passion for perfumes; and particularly for the odor of castoreum, which forms the basis of all the "medicines" used by trappers in effecting the capture of the Lynx.

There are four methods in which the death or capture of the Lynx is effected--by hunting—by the use of the steel-trap, or gin —by the simple snare—and by the medicated cabin: all of which I shall pass briefly in review:—

By hunting.—In this method the hunter pursues the animal generally aided by a dog, and follows its track in the snow, until he forces it to take refuge in a tree, when it is shot: yet so tenacious is the death grip of its powerful claws, that it is sometimes necessary for him to fell the tree, in order to obtain the body.

By the steel-trap.—The gin covered inside the jaws, with a well fitting "pallet" of birch bark, is placed indifferently either under or upon the snow, and on the pallet a piece of hair skin, well rubbed with the 'medicine' is tied. The Lynx on scenting his favourite perfume endeavours to withdraw the skin with his paw, and consequently springs the trap. It does not, like most of the other fur animals drag the trap to a distance, or make violent efforts to escape, it generally lies down until aroused by the ap-

proach of the hunter when it endeavours rather to spring at him than to take to flight.

By the simple snare.—A running noose of platted sinew, thread, or deer-hide thongs, is set in the track that the animal usually follows; this snare is attached to a pole of sufficient weight to toss up the body, and it remains hanging until the hunter passes. The body is sometimes found devoured by crows, wolverines, and Lynx.

By the medicated Cabin.—This is the most efficacious method of catching the Lynx. A round enclosure of some three feet in diameter is made of small willows, or branches of trees, loosely planted in the snow, and about four feet high. Two entrances are left at the opposite sides, each fitted with a snare. In the centre of the enclosure, the medicated skin is placed, inserted in a cleft stick, about eight inches distant from the snow. The snare is more commonly tied to the middle of a loose stick, about 30 inches long, by 3 in diameter, and which is supported on two pronged branches set on each side of the entrance, when circumstances are favorable the tossing pole is sometimes used, and it is the most certain fashion. The animal on scenting the castoreum, inserts its head, or sometimes its forefoot into the noose, which, owing to the long tips on the Lynx's ears, remains securely on the neck when once passed there. After enjoying and rolling itself in the perfume, it moves off; but on finding the stick thumping after its heels, it becomes alarmed and makes for the nearest woods; the stick soon catches in the bushes, and in a short time, the animal, instead of cutting the line, strangles itself, or if caught by the paw remains fixed until the hunter arrives to give it a "*coup de grâce*," if he does not find it already frozen stiff. On some occasions it will gain the top of a lofty tree, and on springing off to rid itself, as it fancies, of the stick, it hangs itself in a superior manner, and puts the trapper to the trouble of cutting down the tree, which is generally a large one.

As an article of food, the flesh of the Lynx, is highly esteemed both by the natives and the white residents. It is of a light colour, and well flavored, the fat, which is soft like that of the bear, lying mostly on the ribs.

CANIS (LUPUS) OCCIDENTALIS. VAR. GRISEUS (*Richardson*).

Grey or Strongwood Wolf.

*Var. White and Barren ground Wolf.**

Sp. ch. Size that of a large mastiff dog, but stands rather higher. Hair long and not coarse, under fur very thick and woolly. Tail very full but not so long in proportion as that of a fox. Colour varies. In barren grounds, variety generally white, in strong wood, dark grey, length from the tip of the nose to the tip of the tail about 6½ feet, weight about 50 lbs.

This is the only species of Wolf in the Mackenzie River District but I am inclined to divide it into two varieties; the dark grey, or the strong wood, and the white, or barren ground. These two are doubtless the same species, though in colouring, locality, and habits there is a considerable difference between them.

The general appearance of both varieties of wolf is rather prepossessing, resembling a good deal that of the native dogs. The head is full, broad between the ears, and tapering towards the snout. The legs, though rather long, are stout with good muscular development. The paws are large, furnished with strong claws, and well furred. The teeth are long and white; and the jaws are of immense power. The eyes are placed obliquely, the inner corner tending downwards. The tail is moderately long and very bushy.

The white wolf is found inhabiting the barren grounds, and the wooded country bordering on them; its migrations being dependent on the movements of the Rein-deer, its principal food. This kind of wolf lives in considerable bands, which unite in hunting parties to run down or surround the deer, driving them over cliffs, or into rivers or lakes as is most convenient. In size they are smaller than the grey variety, though much larger than the Prairie wolf. Their colour is generally a dirty yellowish white with most commonly a stripe of grey down the back; but not always.

The dark grey, or strong-wood variety, which I have styled "Argentatus" from the resemblance of its color to that of the silver Fox, inhabits the wooded country. It most commonly is seen alone, but as many as 6 have been observed in a band. The only specimens of its skin which I have seen, were received at Fort Resolution on Great Slave Lake, and it is evidently still rarer

among wolves, than the silver is among Foxes. In its full winter pelage it is a magnificent animal. The color is a dark silver grey, with a rather browner tint than that of the silver Fox, under the belly a blueish black, the nose and paws black. The size of an old specimen is enormous, the skin being as large, when stretched and dried, as that of a barren ground reindeer.

The northern wolf is a very knowing animal, quite as much so as the fox; out of an immense number which I have heard, I will relate a few well authenticated anecdotes about it, most of which have fallen under my own observation. In the month of May, when the holes cut in the ice do not freeze up, the fisherman at Fort Resolution on visiting his trout lines, set at some distance from the fort, discovered that several had been visited, the lines and hooks were lying on the ice, as well as the remains of a partly eaten trout, and a wolf's track was observed about the place. The fact was that the wolf had hauled up the lines and helped himself to what fish he required. This occurred again and then ceased, the animal having been probably driven away by the dogs of the post. I have never heard of a wolf attacking man, though a dog has been carried off from the winter encampment now and then. When there is but a single wolf, one of our hauling dogs, which are a powerful cross between the pointer and native dog, will make a good fight and often beat off his opponent. The wolf, when taken young, is easily domesticated. It is affectionate and docile to its master, but snappish with strangers and rather quarrelsome with the dogs. A cross between a male wolf and a domestic bitch makes an excellent breed. The offspring are hardy, docile and strong, easily fed, and capable of enduring great fatigue. These hybrids will, contrary to the general rule, have young ones. When there are not too many dogs to drive him off, a male wolf will sometimes have connection with a bitch belonging to the fort, but I am doubtful if a female wolf would permit the attentions of a domestic dog. In the copulating season wolves become rabid, at which time their bite is generally fatal to dogs and other animals. Fearful of expatiating at too great a length upon the subject, I will conclude this anecdotary paragraph by a testimony to the sociability of the wolf, even in a wild state. A full grown wolf remained during the months of July and August 1857 quite domesticated at Fort Resolution. Though rather shy of the people, it lived in great harmony with the dogs, playing and sleeping with them, and sharing their food. Around

the smoke made to keep off the myriads of noxious flies from the cattle it reposed with the other animals, and, although there was a small calf in the band, it never attempted mischief. It was shot at by an Indian and never seen after. Wolves, when pressed by hunger, often come into the square of the fort, and one was shot once when endeavouring to affect an entrance into a meat store.

There are five methods by which wolves are captured or destroyed. By the pitfall; by the gin; by the trap; by the set gun; and by poison.

By the Pitfall.—This method is tolerably successful. A hole about 7 feet deep, broader at the bottom than at the top, is dug during the summer. It is covered with twigs and grass, and after the first fall of snow bears the same appearance as the surrounding ground. In the centre of the hole the bait is laid, and on approaching the animal falls into the pit, when he is easily killed.

By the Gin or Steel-trap.—The trap is set in the usual manner, covered with snow and baited; when caught the wolf struggles violently, and if the trap be not very strong will escape, after which he is very difficult to catch, as he will begin digging at some distance from the trap, which, when reached he will throw aside with his nose, and devour the bait at his leisure. Once securely caught, the wolf will take the bar of wood, to which the trap is fixed by an iron chain in his mouth, and trot off at a desperate pace seeking the worst country he can find. I was once obliged to follow a wolf two days in this manner, and only secured him in the end by the aid of dogs.

By the Wooden Trap.—A large trap of strong pieces of wood is made. First stakes are driven into the earth enclosing a circular space, with two convenient saplings for door-posts, a log of wood, or sleeper, is laid across the door, at the foot of these, with another longer and lighter piece on the top for the purpose of being lifted up when set. The roof of the trap is then covered with small sticks and brush, some logs of wood are laid as weights on the upper piece lying across the door, and a strong stake is driven into the ground to prevent the animal, when caught, from hauling the top piece off the sleeper. The trap is then prepared for setting, to effect this some of the weights are thrown off, and one end of the top piece lifted sufficiently high to permit a stick about a foot long to be inserted upon the

butt of the bait stick which is about 18 inches long with a piece of fish or meat fixed on the point, and is placed inside the trap. The weights are then replaced and some pine brush thrown loosely on the top. This fashion of catching wolves is not very successful, except in the fall and beginning of winter.

By the Set-gun.—This is a very sure method though rather dangerous to the hunter, if he do not take great care. The gun is tied upon two saplings or stakes, set on purpose, opposite the trigger is another thinner stick firmly planted on the ground, a piece of wood is laid across this stick one end pressing the trigger, the other attached to a line to the other extremity of which the bait is affixed. This line is carried under the snow by boring holes in pieces of board and passing it through them; this also prevents the animal from pulling the bait out of the aim of the gun, which he discharges as soon as he hauls upon the line to obtain the meat. Instances have been known of wolves cutting the line close to the trigger of the gun, after which they eat the bait in safety.

By Poison.—In this case strychnine is used, which is an infallible method, though the animals sometimes go to such a distance that it is difficult to follow their tracks; and if a fall of snow come after they have eaten the bait their bodies are often lost. About two grains are required to kill a wolf quickly. But as this article is already too long, I will defer the detailed account of the effect of strychnia on wild animals, until I write the article upon Foxes.

CANIS FAMILIARIS. *Linn.*

Var. *Borealis*, or Esquimaux Dog.

et Lagopus, or Hare Indian Dog.

Sp. ch. (of both). Size, about that of a pointer; ears small and pointed; head broad between ears, and tapering towards muzzle; colour varied, but whites and greys predominate; hair long and fine mixed, with thick under fur; tail long and bushy; general appearance that of a wolf.

In comprising the Hare Indian and Esquimaux dogs among the fur-bearing animals of this district, I am perfectly aware that, in a commercial point of view, they are not included among them; still, from their wild nature, as well as their long and thick fur, I consider that I may with strict propriety class them in the branch

of natural history upon which these notices treat. I should also wish to point out a few errors into which previous writers on these animals have fallen, as well as to submit to the philosophical world some of the results of my experiments and investigations in this branch of animated nature.

The Esquimaux dog *var. Borealis* is found, as its name implies among the Huskey tribes of the Arctic coast. It is of considerable size, muscular and well-proportioned. The ears are small and pointed, and with a good breadth of skull between them, the muzzle is long and sharp, the eyes are placed at angles, not horizontally, the fur is deep and thick, the tail bushy, the feet broad and well covered, and the colour is generally pure white, though other shades are not uncommon.

It is said, with what correctness I cannot venture to say, that the voice of the Esquimaux dog in its native wilds is not a bark but a long melancholy howl. I have had several in my possession all of which barked lustily, but they may have learnt this accomplishment from the dogs of the fort. The similarity of appearance between this dog and the barren ground wolf is very great. It is a hardy animal capable of enduring great extremes of cold and hunger, but in the latter case it becomes very ferocious and instances have occurred of children being devoured by it.

There is no want of sagacity in the Esquimaux dog, its whole look tells of its wisdom and cunning. It is very sociable and fond of its master. When two of this breed of dogs begin fighting, the whole band light on one of the pair and if not prevented will tear him in pieces.

The Hare Indian dog, *var. Lagopus*, is the race domesticated among the Indians of the Mackenzie River District. It is characterised by a narrow, elongated and pointed muzzle, by erect sharp ears, and by a bushy tail not carried erect but only slightly curved upwards, as well as by a fine silky hair mixed with thick under fur. Its colour is tolerably varied in the shades of brown, grey, black, and white. Of these tints the darkest are the most rare. A white or greyish white being the most usual shade. Some writers have supposed this animal to be a domesticated white fox but the thing is highly improbable. The Indian dog, though there are great differences in its size, has on an average more than treble the proportions of this species of fox, moreover it will not have connection with this or any other branch of the sub-

family *Vulpinæ*, while its varied shades of colour are never seen in the pure white pelt of the arctic fox; with wolves on the contrary, not only will they cohabit but will also produce a hybrid offspring that will for several generations procreate one with another. This fact manifests the close connection that both these varieties of dogs have to the wolves, and would almost prove them identical. Thus far I admit, but I do not, for reasons which I shall afterwards give, consider them only domesticated wolves. They are in my opinion, specimens rather of the parent canine stock unaltered by human experiments, and in appearance such as Adam might have named in the garden of Eden.

With foxes of any description neither these nor any other dogs will copulate. At Fort Resolution I had a very fine pair of cross foxes in confinement. They were kept within a roomy enclosure surmounted with lofty stockades. One of the windows of my dwelling-house commanded this enclosure, and at it I used to spend hours observing their actions and movements. When the bitch fox went in heat in the spring she had connection with her mate. And wishing to decide upon the extent of the affinity existing between the fox and the dog, I shut up a small terrier with her. There was no courtship, the parties were mutually indifferent. I tried Indian, half Indian, and our own hauling dogs, but with no success, they evidently would not enter into a matrimonial speculation, though they were friendly enough. This experiment may perhaps be allowed to decide the case in point.

Wild dogs are known to exist in many countries. The Ajuara of S. America, the Dhol of India, and the Dingo of Australia, for instance, all bear a close resemblance to each other, and to the Arctic American dogs, in the most essential particulars. Therefore, seeing that wild dogs as distinct from wolves exist, it is to some such animal that I am inclined to attribute the origin of the dog. From the earliest ages the dog and wolf have been distinguished from each other, and the varieties to which this article is devoted, may have derived their certainly very wolfish appearance from crosses in the breed.

Whatever be the origin of these animals they are of the greatest service, in fact a necessity to the aboriginal dwellers in these dreary and barbarous wilds. They are the only beasts of burthen, and although they have not the strength of the fort dogs, still a train or team of three good ones, will haul a load of upwards of three hundred pounds, five hundred being considered a

good load for the others. Their life is a hard one, far worse than that of a tinker's jackass, a blow or a kick is the usual caress bestowed upon them by their master. Their food is mostly the excrement and offal of the camp, hare-skins and paws, and any other trash too wretched for the far from nice stomach of a Chippewayan Indian. I have seldom or ever seen a fat dog among the natives. They make very good hounds to follow deer or moose on the crust of the snow in spring; for though they have not sufficient strength to bring down these animals themselves, they retard their progress sufficiently to allow the approach of the hunter. I have seen some tolerable retrievers among them also.

I will now conclude this article by offering a just tribute to the affectionate disposition, and kindly habits of this poor and ill-used "friend of man." Scanty fare, harsh treatment and want, seem to make little difference in his love, and these miserable starvelings shew as much if not more affection for their hard-hearted and tyrannical master, than do the pampered and petted favourites of European old maidenhood.

Sub-Family.—VULPINÆ.

Gen. ch. Pupil of the eye elliptical; head slender; upper incisors scarcely lobed; post-orbital process of the frontal bone bent but little downwards, the anterior edge turned up; a longitudinal shallow pit or indentation at its base.

VULPES FULVUS.—*Common American Fox. (Desm).*

Var. A. *Fulvus*, Red Fox.

" B. *Decussatus*, Cross Fox.

" C. *Argentatus*, Silver Fox.

Sp. ch. Hair long, silky and soft. Tail very full, composed of an under fur with long hairs distributed uniformly along it. Distance in red variety between hairs, 6½ inches. Tail with white tip, feet and ears black.

Var. Fulvus. Reddish-yellow; back behind grizzled with greyish. Throat and narrow line on the belly white. Ears behind and tips of caudal hairs (except terminal brush) black.

Var. Decussatus. Muzzle and under parts with legs black, Tail blacker than in the other variety. A dark band between the shoulder, crossed by another over the shoulder.

Var. Argentatus. Entirely black except on the posterior part

of the back, where the hairs are annulated with grey, this occasionally wanting. Tail tipped with white. Baird.

In treating on the different varieties of foxes I have spoken of, it is extremely difficult to mark the line where one ends and the other commences. During my residence in these regions I have seen every shade of colour among them, from a bright flame tint to a perfectly black pelt, always excepting the tip of the tail, which in all cases is white. Even the judgment of an experienced fur trader is sometimes at fault to decide, in bartering, to which of the three varieties a skin should belong, as they bear different prices. Still, notwithstanding this, I consider these colours to have been produced by intermixture of breed. The different varieties, being in my opinion, quite as distinct as those of the human race. And I do not think that any of the progeny of two pairs of red foxes would be either black or cross. In cohabiting the male foxes accompany the females in bands of from 3 to 10, much in the manner of domestic dogs. At Durwegan on Peace River, I have repeatedly observed this. The males fight violently for the possession of the females, many are maimed and some killed. A number of males thus in all likelihood cohabit with the same female, which gives rise to the varieties of colour in a litter. Instances are reported as having occurred in which all the varieties were taken in one den, but of this I am rather doubtful. It is very difficult to tell the future colour of cub foxes, the red appear to be cross, and the cross to be silver, which may have caused an error, though I write under correction. I have seen many Indians even mistaken in this. They have brought me live cub foxes for silver, which on growing up proved to be cross. My own theory is that the silver fox is the offspring of two silver parents, the cross, of a silver and red, the red, of two reds, and the different shades being caused by fresh inter-breeds. Thus two negroes will have neither white nor mulatto children, nor will two whites have black or mulatto offspring. I do not know whether I have explained my ideas on the subject clearly or not. They are the result of my experience on a subject to which I have given no small attention. I have often robbed fox dens, and have also bred the animals, and the summing up of this part of my subject may be thus made—like colours reproduce like, black and red being origins, the cross is the fruit of intermixture between these shades. I kept a pair of cross foxes in confinement at Slave Lake, their offspring were *all cross*. I had only one litter when the bitch died.

Foxes are very shy animals and difficult to tame, indeed when old they appear to pine away in confinement, when young they are playful,but at all times rather snappish. They are far from sociable and generally burrow alone, although it is not uncommon for the members of one family to live together.

The fox-burrow or den is often many yards in length, with various ramifications and side galleries to it, in the centre of which an excavation rather wider than the passages, serves for the sleeping apartment. To this there are always two entrances and often more. The den is kept very clean, and in some dozen which I have opened, I found neither bones of animals nor offal of any kind. To dig out a fox a flat piece of iron, called an earth-chisel, is tied to a stout wooden handle, the trapper inserts a long slender pole of willow, or other flexible wood into the entrance, having stopped up any other that exists, to find the direction in which the passage runs. He then digs another hole and inserts his pole, finding with its point whether any other passage exists, and if so, marking the direction. In this manner he proceeds till he digs to where the fox is, who is generally killed in one of the side galleries, or close to one of the closed entrances. This method of killing a fox entails a large amount of labour, as it often takes a whole day to unearth the animal.

Of all the natural gifts of the fox, the most remarkable is his exquisite sense of smell. When the fox finds a piece of meat or fish he almost invariably hides it, and returns to eat it at some future period. I have remarked this trait even in cubs, which I have reared in confinement, and which used, previous to eating, to dig holes in the snow to bury their food, pushing the snow with their noses to cover it. During the commencement of summer he will lay up a store of the eggs of wild-fowl, for his winter's consumption, these he deposits in holes dug in the sand bars of the river, or in beds of moss, and at the expiration of several months, will, when pressed by want, visit his *caches*. Even when there are several feet of snow on his deposit, he will readily distinguish the place by scenting his urine, with which a fox invariably sprinkles in a liberal manner, all his secret hoards.

This animal is by no means choice in his food; mice, birds, hares, fish, carrion, all come alike to him, and he will even make a meal of a fellow fox if he find one dead in a trap. In summer a great number of young water-fowl are killed by him, and when musk-rats are, by the freezing up of their houses, driven to migrate in the winter, he devours them without mercy.

Respecting any special difference between the three varieties, I can see but very little. The cross fox is generally the largest, and the silver fox the most thickly furred. Some trappers profess to know by the shape of the foot, whether a specimen be that of a silver fox or not; their idea being that the foot of that variety is more rounded than the others. But I have often seen them mistaken. The foot-prints of a young fox of whatever colour, have always this appearance, and the foot of the female is more pointed than that of the male. A popular fallacy also prevails among the "winterers," that a silver fox is more cunning than one of any other colour. I imagine the scarcity of the silver variety originated this fancy.

The foxes of this district are generally of a very large size, and I am doubtful if they do not belong rather to the Macrourus than the Fulvus species. A series of measurements which I will hereafter get taken will decide the question.

The foxes inhabiting the barren grounds often present an appearance similar to that of the Sampson fox, the long hairs of the body and tail are wanting, leaving the soft woolly fur entirely exposed in some specimens, and in others partly so, particularly the sides of the thighs. The natives attribute this to their living so much in their holes, which are generally among rocks, and not roaming about so frequently as those inhabiting the wooded country which often do not visit their dens for weeks together.

The following table shows the proportion of each color traded in this district during the last ten years, and will give a very accurate idea of the relative number of each variety.

Red $\frac{6}{15}$ Cross $\frac{7}{15}$ Silver $\frac{2}{15}$.

Foxes are most prevalent around the great lakes, and on the shores of the Arctic sea. On the Mackenzie River they are also tolerably numerous, but towards the Mountains up the Liard's River they become very scarce.

There are several methods by which foxes are caught and killed, which I will pass in review, detailing those which differ from any already described. 1. By wooden traps; 2. by gin or steel traps; 3. by set guns; 4. by snaring; 5. by hook and line; 6. by hunting; 7. by unearthing; 8. by ice-trap, and 9. by poisoning.

Nos. 1, 2, 3 and 7, have been already noticed, I shall therefore commence with

No. 4, *By snaring.* This is not a very efficacious method,

and is used only by natives who have not steel traps or gins. An enclosure of twigs is made and the bait laid in the centre and a snare set in the entrance with a road fenced in like manner leading to it. The principle of construction is the same as in lynx-snaring, and alike in every respect excepting that the enclosure is larger. Foxes are sometimes found hung in snares set for rabbits.

5. *By hook and line.* This cannot be exactly considered a legitimate method of entrapping foxes, though I have seen one killed by it. An Indian at our establishment was visiting and arranging his lines for catching Loche (*Gadus lota*), when he observed a fox at a short distance from him regarding his operations; he immediately flung the baited hook towards it, and concealed himself behind a block of ice. Reynard approached, smelt rather suspiciously at the bait and at length swallowed it, whereupon the Indian without giving the animal time to cut the line, hauled in and killed it.

6. *By hunting.* This method is practised in the fall before there is enough snow to set the traps. The hunter conceals himself close to the fox's hole, and shoots him as he passes to it.

8. *By ice-traps.* This is a tolerably successful way, more so than by wooden traps. A block of ice of considerable weight is tilted on end at an angle of about 45°, a piece of stick supports this, placed well under the block, the lower end resting on the bait. The animal in his efforts to obtain the bait drags the stick off the perpendicular when the ice falls on him and kills him. This method is much used by the Yellow Knives to trap white foxes.

9. *By poison.* For this purpose strychnia is used. I have tried aconitine, atropine, and corrosive sublimate without success. The two former may not have been pure enough, though I obtained them from the first chemical works in England and at a very high price. The only poison that I have found strong is strychnia. One or two grains of this are mixed with a little tallow, forming a small ball, and covered with a coating of grease outside to prevent the animal from tasting it. A quantity of pounded dried meat and morsels are strewn about so that the animal after swallowing the poison may be detained a sufficient time for it to operate. The distances which animals go before they die vary greatly; in some instances they fall directly, in others they run several miles with the same dose, and arranged in like

manner. This I attribute to several causes; to their fatness, and to the quantity of food in their stomachs, as lean and hungry foxes die much more quickly than others. The medium in which the poison is given also causes a great difference. When put up in fresh meat a very long time elapses before it operates.

Wishing to preserve a specimen of the Hare-Indian dog for the Smithsonian Institution, I resolved to kill the animal by poisoning. Two grains of strychnia of the first strength were administered in a piece of fresh meat, at the end of two hours the animal was as well as ever. I then administered one grain more mixed with grease, in two minutes the spasms began, and in five the animal was dead. The first symptoms were a restlessness and contraction of the pupil of the eye, and a flow of saliva from the mouth, violent cramps then ensued, the head shook violently, like a paralytic person, the legs were drawn up, and the spine took a circular shape, a lull of a few seconds then ensued, when after an attack of great violence the animal died. On dissection the blood vessels of the head and neck were found very full of black and clotted blood, such as I have seen in the jugular vein of a person who had died of apoplexy. There was no inflammation of the stomach, and the fatal bait was found in the throat entire. Once seen, the symptoms of poisoning by strychnia are easily recognized, and I would be certain now of passing a correct opinion on a case of the kind.

Dogs take a longer time to expire than either wolves or foxes; the latter dying most quickly; in fact according to the ratio of the wild nature of the animal who eats it will be the quickness and violence of its death.

VULPES LAGOPUS.—Arctic Fox.

Var. A. *Lagopus*—White Fox.

Sp. Ch. Smaller than American Red Fox; tail very full and bushy, soles of feet densely furred, tip of nose black.

Var. B. *Borealis*.—Blue Fox.

Sp. Ch. Similar to the white in every particular except that of color.

Lagopus—White Fox.

This diminutive Fox which is about as large as a small terrier inhabits the barren grounds and sea coast of this district. On only two occasions have I known it to be caught on the South

side of Slave Lake, once at Resolution and once at Big Island. Its fur is thick, about 2 inches long, white in color with the under fur a lead tint. In winter the animal is white all over excepting the tip of the nose which is black, a light shade of lead is, however visible on the shanks and feet. These are densely furred and the nails are brown. In summer the fur is about an inch in length, white beneath the belly, but owing to the falling off of the long hairs a stripe of plumbous grey annulated with white, and about three inches broad extends from the nape of the neck to the tail, widening towards the rump and passing over the tops of the thighs. The whiskers white in winter, have brown hairs intermixed, and a yellowish tint surrounds the ears, eyes, and mouth, and tinges the shanks and feet. A few long dark hairs may be perceived by careful examination, sprinkled down the back, and the tail has a slight plumbous shade mixed with faint yellow. The color does not approximate in either summer or winter pelage to that of the blue Fox which has been erroneously stated to be the young of the white. The white fox measures in a good specimen which I have before me 22 inches from the tip of the nose to the root of the tail, which measures 13 inches to the end of the hairs. It is an extremely stupid animal, easily killed and very tame. It is sometimes knocked on the head in open day while following the sleds of the Indians. It lives on mice, carrion, birds, especially Ptarmigan, to which it is a deadly enemy.

Borealis.—Blue Fox.

In the lack of positive information upon the subject I am uncertain whether to consider this as a mere variety of the white fox, or to class it as a distinct species, but I will, for the present, consider it as the former.

The Arctic Blue Fox measures 35 inches from the tip of the nose to the root of the tail, which is 13 inches in length to the end of the hairs. Its color in winter is a plumbous brown; the under fur plumbous, and the larger hairs brown at the tips, with white hairs interspersed but not in great numbers. On the head and nape of the neck the color is a reddish grey, like the tint of a silver fox in summer pelage. Under the throat down to the chest, the color is nearly a pure chocolate paling on the belly into a shade similar to that of the back, the sides and flanks are nearly pure plumbous, mingled with white hairs. The legs are brownish grey, and the fur, which covers the soles of the feet

densely, is a dirty white. The claws are nearly an inch long, brown in color, strong, and well curved. The tail is of a like tint with the back, but of a lighter shade. The nose is reddish with a black tip. The fur is remarkably thick and fine, and the tail very full. In summer pelage it is difficult to define the color, but it may be called a smoky brown, on the forehead the grey of the winter coat still remains, and there is also a faint stripe of the same shade down the centre of the back. There is less of the reddish tint throughout than in the winter fur.

It has been supposed that the blue fox is the young of the white fox but this I do not think possible. The specimen now before me is full grown, and in fact it would be a very large animal of the other color. The color is also very rare, for while hundreds of white are traded, not more than six, on an average, of the blue are exported yearly from this District. If they were the young of the white the number would be certainly greater. What are traded are all obtained from the Eskimos inhabiting the sea coast, so that it may justly be termed a littoral animal. On only two occasions, to my knowledge, has it been killed inland, and then at the eastern end of Slave Lake close to, or on the barren grounds. But on inspecting the two animals minutely, so close is their resemblance to one another, except in color, that I am inclined, in default of more precise information, to class them as varieties of the same species, the blue being a rare one and holding the same position that the silver does in the Fulvus species. An examination of a number of skins would doubtless show shades of color filling up the intermediate position that the cross fox holds to the other group.

FAMILY.—*Mustelidæ.*

Fam. Ch. Carnivora with a single tubercular molar tooth only, on either side of the jaw; the sectorial premolar of typical shape; feet five toed: plantipode, or digitipode. Coccum wanting.

The preceding diagnosis, taken from Wagner, expresses in a few words the characters of a group of the carnivora, of which there are several representatives in this District.

In this family are contained three sub-families Martinæ, Lutrinæ and Melinæ. These include several genera, comprising species of some of the most valuable and beautiful fur animals of North America. Of the Mephites, I found the bones, and a portion of the skin of a common skunk, (*Mephitis mephitica*) lying partially

decayed in the woods, at a short distance from Fort Resolution on the shores of Great Slave Lake. But as I have never seen the animal alive there, and the natives report that it does not frequent the county within a considerable distance of that post, this sub-family must be considered as unrepresented in the fauna of Mackenzie's River.

The food of the Mustelidæ is animal. Birds, reptiles, eggs, and especially mice, are eaten by the martins; the otter, and mink eat fish; but the wolverine delights in carrion. This last is a most destructive beast, but an account of its propensities will be given when I come to review the subject in detail.

Although these animals are so fierce and blood thirsty when in their natural state, they are far from difficult to tame, and I have seen martins, ermines, minks and otters, in confinment which appeared affectionate and graceful pets; and there is no reason why the wolverine, fisher, and skunk, should not become equally docile, though I doubt if any person would much like the latter animal about the house.

Sub-Family.—*Martinæ.*

Upper true molar short, transversely elongated, molars unequal in the two jaws. Soles generally hairy, the walk more or less plantigrade. In this sub-family are included several animals inhabiting the colder regions of North America, and whose fur is among the most valuable produced on this continent. It contains 3 genera:

1. Mustela. 2. Putorius. 3. Gulo.

All of which have representatives in this District.

1. Mustela.—Lin.

Teeth 38. Molars one above, and two below, premolars four on each side above and below. Lower sectorial tooth with a small internal tubercle. Body slender: tail rather long.

This Genus embraces the martins in distinction to the weasels. Its species are usually of large size, arboreal habits, and all of them yielding peltries of great value. Two and possibly three species inhabit this district, the largest of which is *M. Pennanti*, another is *M. Americanus*, or American pine martin; and the sable, *M. Zebellina*, will probably be found in the Northern and N. W. regions to constitute a third.

MUSTELA PENNANTI.—*Erxleben.*

Sp. Ch. Legs, tail, belly and hinder part of back, black, the back with an increasing proportion of greyish white to the head. Length over two feet. Vertebræ of tail exceeding twelve inches.

This animal is the Pecan or Fisher of the fur traders. In this district it is not found except in the vicinity of Fort Resolution, which may be considered as its northern limit. In the numerous deltas of the mouth of Slave River it is abundant, frequenting the large grassy marshes or prairies, for the purpose of catching mice, its principal food. In appearance it bears a strong family likeness to both the martin and the wolverine. Its general shape assimilates more to the former, but the head and ears have a greater similitude to those of the latter. It is named by the Chippewayan Indians "Thâ chô," or great martin. Its neck, legs and feet are stouter in proportion than those of the martin, and its claws much stronger. In color and size it varies greatly. Young full-furred specimens, or those born the previous spring, can scarcely be distinguished from large martins except by a darker pelage and a less full, and more pointed tail. As it advances towards old age, the color of the fur grows lighter, the long hairs become coarser and the greyish markings are of greater extent and more conspicuous.

The largest fisher which I have seen, was killed by myself on the Rivière de Argent, one of the channels of the mouth of the Slave River, about 15 miles from Fort Resolution. It was fully as long as a Fulvus fox, much more muscular and weighed 18 lbs. In the color of its fur the greyish tints preponderated, extending from half way down the back to the nose. The fur was comparatively coarse; though thick and full. The tail was long and pointed, and the whole shade of the pelage was very light and had rather a faded look. Its claws were very strong and of brown color; and as if to mark its extreme old age the teeth were a good deal worn and very much decayed. I caught it with difficulty. For about two weeks it had been infesting my martin road, tearing down the traps and devouring the baits. So, resolved to destroy it, I made a strong wooden trap. It climbed up this, entered from above, and ate the meat. A gun was next set but with no better success, it cut the line and ran off with the bone that was tied to the end of it. As a "*dernier resort*" I put a steel trap in the middle of the road, covered it

carefully, and set a bait at some distance on each side. Into this it tumbled. From the size of its foot-prints my impression all along was that it was a small wolverine that was annoying me, and I was surprised to find it to be a fisher. It shewed good fight, hissed at me much like an enraged cat, biting at the iron trap, and snapping at my legs. A blow on the nose turned it over when I completed its death by compressing the heart with my foot until it ceased to beat. The skin when stretched for drying was fully as large as a middle sized otter, and very strong, in this respect resembling that of a wolverine.

In their habits the fishers resemble the martins. Their food is much the same, but they do not seem to keep so generally in the woods. They are not so nocturnal in their wanderings as the foxes. An old fisher is nearly as great an infliction to a martin trapper as a wolverine. It is an exceedingly powerful animal for its size, and will tear down the wooden traps with ease. Its regularity in visiting them is exemplary. In one quality it is however superior to the wolverine, which is that it leaves the sticks of the traps lying where they where planted; while the other beast if it can discover nothing better to hide, will câche them some distance off. It prefers flesh meat to fish, is not very cunning, and is caught without difficulty in the steel-trap. Fishers are caught by methods similar to those employed in fox-trapping.

Mustela Americana.—*Turton.*

Pine, or American Martin.

Sp. ch. Legs and tail blackish, general color a deep and rich orange brown clouded with black along the back. Head generally light coloured, with the tips of the ears and a stripe along the cheeks yellowish white. A broad orange patch is visible on the throat in some, in others this is nearly pure white, and in many entirely wanting. Sometimes, but rarely, the tip of the tail is white. Tail vertebræ about a third of the length of the body, often longer, outstretched hind feet reach nearly to the end of the tail with the hairs.

The *M. Americana*, as found in this District, is smaller than the fisher, but larger than the ermine weasels. In its shape it is less muscular, but more graceful than the former of these animals. Its head is somewhat depressed, acute, and broader than might be looked for in so lengthened a skull. The ears are slightly pointed

and covered densely on both sides with a short velvety fur, overlaid with coarser hairs. The legs are robust, rather short, and clad with a closer and stiffer hair than that on the body. The claws are about half an inch long, not very stout but sharp, well curved, and white in color. The tail is considerably less than half the length of the body generally, though it is sometimes longer; it is well covered and tolerably bushy. The feet are comparatively large, densely covered with short woolly fur, mingled with stiffer hairs, which prevents the naked balls of the toes from being visible in winter, though they are distinctly so when the animal is in summer pelage.

The winter fur of this species is full and soft, about an inch and a half deep with a number of coarse black hairs interspersed. The tail is densely covered with two kinds of hair, similar to those of the back but coarser. The hairs on the top are longest, measuring $2\frac{1}{2}$ inches and giving the end a very bushy appearance. The fur is in full coat from about the end of October until the beginning of May, according to locality. When in such a condition the cuticle is white, clean, and very thin. From the latter of these dates the skin acquires a darker hue which increases until the hair is renewed, and then gradually lightens until the approach of winter, the fur remaining good for some time before and after these changes. When casting its hair the animal has far from a pleasing appearance, as the under fur falls off leaving a shabby covering of the long coarser hairs, which have then assumed a rusty tint. The tail changes later than any other part, and is still bushy in some miserable looking summer specimens now lying before me. After the fall of these long hairs, and towards the end of summer a fine and short fur pushes up. When in this state the pelage is very pretty and bears a strong resemblance to a dark mink in its winter coat. It gradually lengthens and thickens as winter approaches, and may be considered prime after the first fall of snow.

It is difficult to describe the color of the martin fur accurately. In a large heap of skins (upwards of fifty) which I have just examined minutely, there exists a great variety of shades darkening from the rarer of yellowish-white and bright orange, into various shades, of orange-brown some of which are very dark. However, the general tint may with propriety be termed an orange brown, considerably clouded with black on the back and belly, and exhibiting on the flanks and throat more of the orange tint.

The legs and paws as well as the top of the tail are nearly pure black. The claws are white and sharp. The ears are invariably edged with a yellowish white, and the cheeks are generally of the same hue. The forehead is of a light brownish grey, darkening towards the nose, but in some specimens it is nearly as dark as the body. The yellowish marking under the throat, (considered as a specific distinction of the pine martins) is in some well defined, and of an orange tint, while in others it is almost perfectly white. It also varies much in extent reaching to the forelegs on some occasions. At other times it consists merely of a few spots, while in a third of the specimens under consideration it is *entirely wanting*.

After minutely comparing these skins with Professor Baird's and Dr. Brandt's description of the martins, and the latter gentleman's paper on the sables, I find that the *M. Americana* of this district agrees in general more closely with the latter, and am therefore disposed to coincide with that gentleman in his opinion that they are only varieties. The martins of this district bear a greater resemblance to the sables of Eastern Siberia than to the martins of Europe, holding, as it may be with propriety said, an intermediate position. I am also inclined to believe that the various colors found in these regions are simply varieties of the same species, and that the difference, if any, seen in the Zib. are merely continental. In summer when the long hairs have fallen off, the pelage of this animal is darker than in winter. The forehead changes greatly, becoming as deeply colored as any other part of the body, which is of an exceedingly dark brown tint on the back, belly, and legs. The yellow throat-markings are much more distinct at this season, but vary much both in color and extent, though in only one summer skin are they absolutely wanting. The white edging on and around the ears still remains, but the cheeks assume a greyer tint. The tail is not so full, but from the high North latitude (the Arctic coast) from which these skins were procured it is still rather bushy. One of the specimens has the dark hairs laid on in thin longitudinal stripes, causing a curious appearance.

Martins are found all over this district, except on the barren ground to which, as they are arboreal animals, they do not resort. Their dens are sometimes excavated, but more frequently are made in a tree. Their principal food is mice, and they are therefore abundant whenever these little creatures are plentiful.

The periodical disappearance of this species is very remarkable It occurs in decades, or thereabouts, with wonderful regularity and it is quite unknown what becomes of them. They are not found dead. The failure extends throughout the Hudson Bay Territory at the same time. And there is no tract, or region to which they can migrate where we have not posts, or into which our hunters have not penetrated.

They are caught commonly in wooden traps baited with white-fish heads, pieces of flesh meat, or still better with the heads of wild-fowl, which the natives gather for this purpose, in the Autumn. When they are at their lowest ebb in point of numbers, they will scarcely bite at all. Providence appears thus to have implanted some instinct in them by which the total destruction of their race is prevented. Martins are easily tamed, and look exceedingly pretty as pets. When enraged they utter a sound somewhat like the hissing of a domestic cat.

Putorius, *Cuvier.*

"Teeth 34: molars one above and two below: pre-molars three above and three below, on each side. Lower sectorial tooth without an inner tubercle. Body slender; tail unusually long.

The most striking difference between this genus and the genus *Mustela* consists in having one molar less on each side above and below. The size is generally smaller, and the body more slender in the typical species.

The genus includes many North American groups, which may almost be considered as generic, or at least of sub-generic value. They may be characterized as follows :—

Putorius. Body stout, darker below than on the sides. Of this particular group America has no immediate representative.

Gall. Body elongated and very slender. Lighter above than below on the sides. Naked pads on the feel small, more or less hidden by the hair. To this group belong all the American weasels, except the minks, unless the *P. negripes* of Aud. and Bach., should prove an additional exception.

Lutreola. Color nearly uniform all over. Feet much webbed. The naked pads on the feet large, not covered up by the hairy soles; the intervals between the metacarpal and metatarsal pads not occupied by hairs. Posterior upper molar longer than in Gale." Baird.

Of the above the only species which can be included among our fur-bearing animals is:

PUTORIUS VISON, *or common Mink.*

Sp. ch. Tail about half as long as the body. The winter color varies, according to the age of the specimen, from a very dark blackish brown, to a deep chesnut. Tail not bushy and very black. End of chin white. Length of head and body about 20 inches. Length of tail with hairs about 10 inches.

In shape the mink resembles an otter, as it also does in the color and quality of its fur. In size it generally has about the same dimension as the *M. Americana.* The color of its pelt varies greatly. In winter its shades range from a dark chesnut to a rich brownish black. The tint of all the body is uniform, except that the belly is sensibly lighter, and that there is a series of white blotches, running with greater or smaller breaks from the end of the chin to some distance below the forelegs, and again continued with more regularity from the middle of the belly to the anus. In some skins these markings are of small extent, but I have never seen them entirely wanting. There are commonly spots under either one or both of the forelegs, but not invariably. I have remarked that the coloration of this animal as well as that of the Otter and Beaver grows lighter as it advances in years, and that the white blotches or spots are of greater size and more distinctness in the old than in the young. The fur of a young mink (under three years) when killed in season is very handsome, its color is often an almost pure black. The skin is thin and pliable, approaching nearly to the papery consistency of that of the martin. When aged the hide is thick and the color more rusty. The summer pelage is short, but tolerably close, and is of a reddish brown color, and the tail though still possessing black hairs, shews distinctly the under fur of a decidedly rusty hue. Its feet are rather pointed, and not large. Its legs are short but muscular, and its track in the snow is easily distinguished from that of the martin, whose longer and well covered paws do not sink so deeply. Indeed when the snow is at all deep and soft, the mink makes a regular furrow, similar to that made by an otter under like circumstances, though of course smaller. Its claws are white and about $\frac{1}{2}$ of an inch long. The mink is easily tamed and is exceedingly graceful in its movements. When it locates near

a settlement, such as Red River, it is a dreadful destroyer of domestic poultry. In the wilderness it exercises this propensity on birds and water-fowl. It is almost omnivorous, being equally fond of fish and flesh.

The various methods of trapping this animal have been already detailed, and are similar to those employed in the capture of the martin. It is not difficult to catch in steel traps, though rather shy of wooden ones.

I am strongly inclined to the opinion that there is only one species of mink on this continent, and consider it highly probable that the *P. Nigrescentes* of Aud. & Bach are merely common minks under 3 years of age. I have seen numbers of skins here of exactly the same color, size, and furring as those described under that head in Prof. Baird's work on North American Mammals, which were simply young *P. visones*. This gentleman also states that the American species of mink never has the edge of the upper lip white. I have never seen *the whole* of that part so coloured, but in one specimen now on my table there is a white spot beneath the nostrils.

Gulo: *Storr.*

"Teeth 38, molars 5 above and 6 below. Lower sectorial teeth without any internal tubercle. Soles densely hairy with 6 small naked pads. Tail about as long as the head, very full and bushy Body stout, bear-like. Baird.

Gulo Luscus, *Wolverine.*

Sp. Ch.—The winter color, dark brown along the back. A broad band of much lighter yellowish brown passes from the shoulder downwards along each side to the root of the tail Forehead, cheeks, and nape of the neck grey. A number of yellow, orange, or white spots irregularly scattered from the throat to the foreleg. Feet and end of tail black. Dental formula incisors $\frac{3}{3}\frac{3}{3}$, cansores $\frac{1}{1}\frac{1}{1}$, premolars $\frac{4}{4}\frac{4}{4}$, molars $\frac{1}{2}\frac{1}{2}=\frac{1}{2}\frac{8}{0}=38$.

The head of the Wolverine bears, in colouring and in shape, a strong likeness to that of the *M. Pennanti.* In general appearance and movements it greatly resembles the *Ursus Americanus*, as well as in the consistency and length of its fur. Its walk, however, is not nearly so plantigrade as that of the latter animal,

as is evident from an inspection of the soles of its feet, which are densely covered with hair. The head is broad and rounded, and the nose not so acute as in members of the genus *Mustela*. The eyes are small and far apart, the ears low and rounded, thickly covered on the outside with a long soft fur which nearly conceals them. The whiskers are comparatively short, stiff, and not numerous; and there are over each eye sparse tufts of similar hairs.

The body is long and stout, of great muscular power, and formed more for strength than activity. The feet are larger in proportion than those of any other species of the sub-family Martinæ, and are armed with strong claws, well curved and over an inch in length.

The skin which I propose now to describe is that of a female killed in last March. It is that of an average sized animal, whose coloration also is of the ordinary shades, and may be accepted with great propriety as a type of the species as found in this district. The pelage in winter is formed of a soft woolly under-fur, tolerably fine and about an inch deep and overlaid by larger and coarser hairs, which are about 3 inches long on the rump, but shortening gradually towards the head where they measure only half an inch. The feet are large and broad—the hind feet larger than the fore feet—and all densely covered with mingled fur and hair about $\frac{3}{4}$ of an inch in depth. The balls of the toes are naked, but from the thickness of the coverings of the feet, they leave no impression upon the snow. By careful examination three additional small bare pads will be discovered on each foot. The nails are strong, sharp, well curved, white, and upwards of an inch in length, those of the fore feet being, if anything, the stronger, though there is little difference either in length or shortness. Comparatively speaking the tail is rather short, very bushy, particularly towards the end, which has the appearance as if a piece were cut off. The fur covering it is of the same kind as that on the body, but the under fur is not so thick, and there are more of the coarse hairs which are here from 5 inches long at the root to 6 at the tip. The color of the fur varies much according to the season and age. The younger animals are invariably darker in the shadings than the old, which exhibit more of the grey markings. In the specimen under consideration, the back from the nape of the neck to the rump is a dark blackish brown perceptibly lighter on the

neck and shoulders. From the fore-leg a stripe of yellowish brown, about 3 inches broad, sweeps round each side, and grows lighter as it proceeds, passes over the tops of the thighs and ends at the root of the tail, giving the back of the animal almost the appearance of an Eskimo's tunic or shirt: and it is possible that these people may have borrowed their fashion from the Wolverine, whose fur is greatly in request among them. The colors of the head are thus arranged. From the nose to between the eyes and around them the hair is very short and is almost quite black. The forehead, ears, cheeks, and nape are of a brownish grey shade which gradually changes as it meets the darker tints and longer fur of the body. From the chin to the fore-legs along the throat, a black stripe of varied breadth extends, broken with large blotches of white or orange yellow. The belly is of the same shade as the back until near the anus, where a spot of bright orange yellow hairs extends to about four inches. The root half of the tail is light yellowish brown, and the top mostly black without any mixture of white hairs.

The legs and feet are black. There is a yellowish spot on the inner side of the fore-legs about half way down, and the fur of the soles is of a light brown tint. The summer pelage is of a light color, course and thin. In some specimens the yellowish fringing of the sides and rump is almost entirely white and of larger extent, leaving but a narrow stripe on the centre of the back dark. In such the hoary markings of the head would be of greater extent, and descend, most probably, to the shoulders.

In examining the skull of the Wolverine, the most striking points are the shortness and broadness of its muzzle, and the roundness of the cranium, giving promise of a certain quantity of reasoning powers, which the nature and habits of this animal do certainly not belie. The entire structure is massive, the skull and bones are thick and ponderous, and the muscles of the neck and limbs of immense volume. Indeed every requisite is apparently united to form a beast of extraordinary strength, and I do not wonder now at the almost fabulous feats, considering its size, that it has performed. The first measurements of the following table are taken from Prof. Baird's work on North American Mammals, and are inserted for comparison. He does not mention whether the specimen was measured before or after skinning, or whether it was an ordinary "case" skin, or purposely prepared for a Natural History specimen. If it be a common trading

peltry the measurements will appear of a much larger animal than the reality

	Dimensions of the skin in Smith. Institute from F. Union Nebraska	Dimensions of a female (March) from McKenzie River.
	Inches.	Inches.
Length from nose to eye		2.80
" " ear		6.10
" " occiput		6.90
" " to root of tail	36.00	34.80
Length of vertebræ of tail	9.00	8.00
" tail to end of hairs	14.00	13.00
Height of Ear		2.00
Length of forefoot with claws		4.40
" hind foot		5.60
" claws (average)		1.00
" upper canines		.90
" lower canines		.75
" longest hairs of tail	7.00	7.50
" " " of body	4.00	4.00

The habits and food of the Wolverine are similar to those of the Martin. It hunts birds, hares, mice, and will also occasionally kill disabled animals of the deer kind. But its greatest notoriety arises from the mischief which it does to the caches of meat, and trapping roads, both of the natives and white residents. The strongest caches built of green logs, and a foot in diameter, and dove-tailed it will manage to effect an entrance into. After satisfying its hunger, it is not yet contented, but carries off the remainder of the pieces of meat, even those weighing upwards of 100 lbs., transporting them to some distance and burying them in the snow.

By following the animal's footprints those hidden stores can be recovered; but in general quite uneatable, as the wolverine to protect its secret hoards from the attacks of other beasts of prey besprinkles all his larder plentifully with his urine, which has a strong and most disagreeable odour, and proves a good preservation in most cases. But the desire for accumulating property seems so deeply implanted by nature in this animal, that like tame ravens, it does not appear to care much what it steals so that it can exercise its favourite propensity to commit mischief. An instance occurred within my own knowledge in which a hunter and his family having left their lodge unguarded during their absence, on their return found it completely gutted, the walls were there, but nothing else. Blankets, guns, kettles, axes, cans, knives and all the other paraphernalia of a trapper's tent had vanished, and the tracks left by the beast shewed who had been the thief. The family set to work and by carefully following up all his paths recovered, with some trifling exceptions, the whole of the lost property. The damage which it does to a trapping road is very great, indeed, if the animal cannot be killed it is as well to abandon it as he will not only break the traps and eat the bait or animals caught, but also out of sheer malice will carry away the sticks and hide them at some distance. To kill or catch it is very difficult. An old stager is a regular bug-bear to the Indians. "Master," said one to me in his own language, "I cant hunt furs, the wolverine eats the martins and baits, and smashes my traps, I put a steel trap for him, he got in, but released himself by screwing off the nuts confining the spring with his teeth. I set a gun, he cut the cord attached to the trigger, ate the bait, and broke the stock, what shall I do?" As the infallible strychnia had not then made its appearance in these parts, I could offer him neither advice nor assistance, and but little consolation.

Sub-family.—LUTRINÆ.

Mustelida with the upper posterior tubercular molar large, quadrate. The number of molars the same in each jaw. Feet short, palmated. The typical otters bear a strong resemblance to the minks, the last mentioned group of the weasels, although the skull and teeth approximate much more nearly to the Melina. The body is elongated, the feet short, the toes palmated. The species are generally of large size and all more or less aquatic.

The group of the Otter embraces three principal genera; *Lutra*,

Pterura, Enhydris. The former again have been subdivided into those with claws well developed, and those with very rudimentary ones or none at all. *Pterura* is a distinct Genus, having the tail dilated laterally on either side. "Of *Lutra* N. America probably possesses two species, of *Enhydris* one." BAIRD.

LUTRA CANADENSIS.—*American Otter.*

"Sp. ch. length about 4½ feet muzzle longer than wide, sending down a naked point along the median line of the upper lips anteriorly. Under surfaces of the feet so covered with hair towards the circumference as completely to isolate the naked pads of the tips. A hairy strip extending forward from beneath the carpus on the palm. Color above, liver brown barely lighter beneath, inferior surface and sides of head dirty whitish." BAIRD.

In appearance the otter is a magnified mink. Its walk, fur, and color bear strong similitudes to those of the latter animal, and the lightening of the tints of the pelage in old age is the same in both. Its fur is short and thick, the under fur being of a silvery white shade, slightly waved and silky, and of similar texture to that of the beaver but not so long. The color of the overlying hairs varies from a rich and glossy brownish black to a a dark chesnut. In summer the color is a rusty brown, and the fur is shorter and thinner. The habits of the otter are aquatic. From the shortness of its legs its motions on shore are not so quick as when in the water and as its food is principally fish, it resides in winter near some lake or river where it keeps a hole open in the ice all the season. During this period of the year its migrations on land are toilsome and it leaves a deep furrow or path in the snow, which when seen by the trapper soon after the animal has passed, invariably leads to the distruction of the animal. If a trap be set on this road the otter is nearly certain to be caught, as it has a strong objection to opening new paths through the deep snow. In firing at an otter in the water care must be taken not to shoot it in an immediately vital part as if death ensue instantaneously the body will sink like a stone.

Whether the *Lutra Californica* be found in this district, or whether that animal be only a variety of the species under consideration I cannot say: but an examination of a greater number of specimens will, in time, determine the matter.

Family.—URSIDÆ.

"Fam. Ch. Toes distinctly separated, five on each foot; walk plantigrade; coccum wanting. The sectorial tooth and the molars behind them tuberculated.

URSUS.—*Linn.*

Gen. Ch. Body thick, clumsy, and large. Feet entirely plantigrade; soles naked; nails long; tail very short; head very broad. Dentition. incisors $\frac{3}{3}:\frac{3}{3}$ caniues $\frac{1}{1}:\frac{1}{1}$ premolars $\frac{4}{4}:\frac{4}{4}$ molars $\frac{2}{3}:\frac{2}{3}$ $\frac{2}{2}\frac{0}{2}=42$." BAIRD.

Of this sub-family those found in this district will probably be: 1. *Ursus Americanus.* 2. *Ursus Horribilis.* 3. *Ursus Maritimus*, and 4. *Ursus Arctos* or Barren Ground Bear.

Of the identity of the second and fourth of these, I am not by any means certain, and one at least, if not both, will probably be found to be an unnamed if not an undescribed species.

ARTICLE III.—*Addenda to the Natural History of the Valley of the River Rouge.* By W. S. M. D'Urban.

(*See pages* 81—99 Vol. V.)

LEPIDOPTERA.

The names and descriptions of the following species were not received from Mr. Francis Walker in time for publication in their proper places, in the second part of the "Natural History of the River Rouge," contained in the April number of this Magazine.

Sphingina.—Family, Ægeriidæ, *Steph.*

Thyris vitrina, Boisd. Bevin's Lake, Montcalm, 5th July.

Bombycina.—Family, Liparidæ, *Walker.*

Dasychira clandestina, Walker, M. S. S., n. sp. Bevin's Lake, Montcalm, 7th July.

"*Mas.* Cinerea, nigroraria, densè pilosa; antennæ breves, latè pectinatæ; pedes breves, pilosissimi; alæ nigro nebulosæ, lineis quatuor denis undulatis nigris apud costam dilatatis."

"*Male.* Cinereous, varied with black, thickly pilose. Antennæ short, broadly pectinated. Legs short, very pilose. Wings partly shaded with black, with four irregular undulating black lines which are dilated on the costa of the forewings; under side paler, with the lines obsolete except by the costa. Length of the body 6 lines, of the wings 14 lines." *Walker, M.S.S.*

Audela. N. G. Walker, M.S.S.

Mas. Corpus crassum, pilosissimum. Proboscis brevis, tenuis. Palpi breves, graciles, obliquè ascendentes; articulus 3us longi-conicus, 2i dimidio brevior. Antennæ subpectinatæ, ramis subclavatis. Abdomen depressum, apice quadratum, alas posticas paullo superans. Pedes robusti, pilosissimi, calcaribus breviusculis. Alæ validæ; anticæ apice subrotundatæ, margine exteriore vix convexo sat obliquo."

"*Male*. Body thick, very pilose. Proboscis short, feeble. Palpi short, slender, obliquely ascending; third joint elongate-conical, less than half the length of the second. Antennæ slightly pectinated; branches subclavate. Abdomen depressed, quadrate at the tip, extending a little beyond the hind wings. Legs stout, very pilose; spurs rather short. Wings stout, moderately broad. Forewings somewhat rounded at the tips; costa straight; exterior border hardly convex, rather oblique; interior angle not prominent."

Audela acronyctoides, Walker, M.S.S., n. sp. Township of Montcalm, June.

"*Mas*. Albida, nigro-varia; antennæ fulvæ; abdomen nigricans, segmentis albido marginatis; alæ anticæ nigricantes, fasciis tribus albidis, 1a lata diffusa informis, 2a 3a que angustis angulosis subparallelis, liturâ discali obliquâ sublunatâ nigro marginatâ; posticæ pallidè cinereæ, trilineatæ."

"*Male*. Whitish, mingled with black. Antennæ tawny. Abdomen blackish; hind borders of the segments whitish. Legs mostly black; tarsi with white bands. Forewings blackish with three whitish bands, first band broad, diffuse, very irregular; second and third slender, zigzag, nearly parallel to each other; discal mark oblique, sublunate, black-bordered; fringe blackish, with white streaks opposite the veins. Hindwings pale cinereous; discal mark, one interior and two diffuse undulating exterior lines, dark cinereous. marginal line black. Length of the body 9 lines; of the wings 18 lines." *Walker, M.S.S.*

Family, Notodontidæ, *Steph.*

Heterocampa semiplaga, Walker, M.S.S., n. sp. Common, Township of Montcalm, June.

"*Mas et Fœm*. Cinerea, densè pilosa, olivaceo subtincta; palpi obliquè ascendentes; thorax posticè et abdomen basi nigra; alæ nigro nebulosæ, lineis tribus nigris denticulatis indistinctis, linea marginali nigra, fimbria nigro punctata; anticæ linea submarginali e guttis nigris."

"*Male and Female*. Cinereous, thickly pilose, with a slight olive-green tinge, whitish cinereous beneath. Palpi distinct, obliquely ascending, not extending beyond the frontal tuft. Thorax by the hind border and abdomen at the base black. Wings partly clouded with black, adorned with three indistinct irregular denticulated black lines; marginal line black; fringe with black points. Fore-

wings somewhat rounded at the tips, with a submarginal line of black dots. *Male.* Antennæ tawny, moderately pectinated to three-fourths of the length. *Female.* Antennæ simple. Length of the body 9 lines; of the wings 20 lines. *Walker, M.S.S.*

Noctuina.—Family, Bryophilidæ, *Guén.*

Bryophila? spectans, Walker, M.S.S., n. sp. Township of Montcalm, June.

"*Mas.* Alba, nigro varia; palpi lanceolati, caput superantes, nigro fasciati; abdomen cinereum, segmentis albo marginatis; alæ anticæ lineis duabus nigris duplicatis valdè dentatis, 2a valdè flexa, orbiculari et reniformi e annulis duabus magnis incompletis nigris, guttis marginalibus nigris; posticæ litura discali lineaque dentata undulata nigricantibus."

"*Male.* White, varied above with black. Palpi lanceolate, extending somewhat beyond the head; second joint with a black band. Abdomen cinereous, white at the tip and on the hind border of each segment. Tarsi with black rings. Forewings with two pairs of very dentated black lines, of which the outer pair is much bent, orbicular and reniform marks forming two large incomplete black ringlets, of which the outer one has the usual form; marginal dots black. Hindwings above and below, and forewings below, with a discal mark and an undulatiug dentate line blackish. Length of the body 5 lines; of the wings 14 lines." *Walker, M.S.S.*

Family, Bombycoidæ, *Guén.*

Microcelia? retardata, Walker, M.S.S., n. sp. Locality not recorded.

"*Mas.* Pallide cinerea; palpi obliquè ascendentes, nigro fasciati, articulo, 3o longiconico; antennæ breviusculæ; alæ anticæ lineis, tribus dentatis nigris, linea 1a basali, 2a 3a que duplicatis, 3a flexa orbiculari et reniformi nigricante notatis et marginatis, fimbria nigro punctata; posticæ litura discali lineaque exteriore undulata nigricantibus."

"*Male.* Pale cinereous. Palpi obliquely ascending, not rising higher than the vertex; second joint with a broad black band; third elongate-conical less than half the length of the second. Antennæ rather short. Abdomen not extending beyond the hindwings. Forewings with five dentated black lines, of which one is basal, and the other four form two pairs which are remote from each other, the outer pair much bent; orbicular and reniform marks large, of the usual form, with blackish disks and black borders; fringe with black points; underside and hind wings with a discal mark and an undulating exterior line blackish, these are most distinct on the under side of the hind wings. Length of the body 4½ lines; of the wings 14 lines." *Walker, M.S.S.*

Family, Noctuidæ, *Guén.*

Agrotis spissa? Guén. Hamilton's Farm, August.

Family, Orthosiidæ, *Guén.*

Cerastis anchocelioides, Guén. Township of Montcalm, June.

Geometrina.—Family, Ennomidæ, *Guén.*

Hyperetis alienaria, Herr Sch. Township of Montcalm, June.

Endropia refractaria, Guén. Common near Hamilton's Farm, 4th September.

Azelina Hubneraria, Guén. Locality not recorded.

Family, Boarmidæ, *Guén.*

Cleora limitaria, Walker, M.S.S., n. sp. Sixteen-Island Lake, May.

"*Fœm.* Albida; palpi nigri, brevissimi, caput pallo superantes; alæ antice lineis quinque dentatis undulatis nigris, fasciis tribus fuscente cinereis, 3a posticè abbreviata, linea marginali e punctis nigris; posticæ gutta discali, lineis duabus, exterioribus indistinctis." *Walker, M.S.S.*

"*Female.* Whitish. Palpi black, very short, rising very slightly above the head. Antennæ pale cinereous. Forewings with five dentated, undulating black lines, and three brownish-cinereous bands, the third abbreviated behind: the marginal line spotted with black. Hind wings with a faint discal spot, and two exterior indistinct lines. Length of the body 4½ lines; of the wings 14½ lines."

Cleora diversaria, Walker. Township of Montcalm, June.

" *distinctaria*, Walker. Sixteen-Island Lake, Montcalm, May.

Boarmia converzaria, Walker, M.S.S., n. sp. Township of Montcalm, June. (Description omitted).

" *inordinaria*, Walker, M.S.S., n. sp. Township of Montcalm, June. (Description omitted).

" *cunearia*, Walker, M.S.S., n. sp. Abundant, Sixteen-Island Lake, Montcalm, May. (Description omitted).

" *divisaria*, Walker, M.S.S., n. sp. Township of Montcalm, June. (Description omitted).

" *? patularia*, Walker, M.S.S., n. sp. Very numerous, Sixteen-Island Lake, June. (Description omitted).

Family, Acidalidæ, *Guén.*

Acidalia junctaria, Walker, M.S.S., n. sp. Locality not recorded.

"*Fœm.* Candida; caput antice nigrum; palpi brevissimi; thorax antice testaceus; alæ nigro subconspersæ, lineis duabus testaceis indistinctis obliquis."

"*Female.* Pure white. Head black in front. Palpi very short. Foreborder of the thorax testaceous. Legs slightly testaceous-tinged. Wings very minutely black speckled with two indistinct oblique testaceous lines. Length of the body 4 lines; of the wings 11 lines." *Walker, M.S.S.*

Family, Caberidæ.

Corycia hermineata, Guén. Township of Montcalm, June.

Family, Macaridæ.

Macaria? subapiciaria, Walker, n. sp. Locality not recorded.

"*Mas.* Albida, gracilis; palpi breves, subascendentes; antennæ pubescentes; alæ fusco densè conspersæ, litura discali fusca, punctis marginalibus nigris; anticæ lineis quatuor fuscis diffusis indistinctis nigricante notatis; posticæ angulatæ."

"*Male.* Whitish, slender. Palpi short, slightly ascending, extending very little beyond the front. Antennæ pubescent. Wings thickly speckled with brown; discal mark brown; marginal points black. Forewings with four diffuse and very indistinct brown lines, which are distinguished by some blackish marks, and end on the costa in four blackish spots; the adjoining spaces more white than the wings elsewhere. Hind wings with the exterior border angular. Length of the body 5 lines; of the wings 14 lines." *Walker, M.S.S*

Family, Larentidæ, *Guén.*

Melanippe propriaria, Walker, M.S.S., n. sp. Common, Sugar-bush Lake, Montcalm, June.

"*Fœm.* Nigra; corpus subtus albidum; palpi porrecti, brevissimi; anticæ fascia exteriore lata nivea apud angulum interiorem subfurcata."

"*Female.* Black, slender. Body and legs whitish beneath. Palpi porrect, very short, hardly extending beyond the front. Forewings with a broad exterior upright snow-white band, which is slightly furcate by the interior angle. Length of the body 3½ lines; of the wings 10 lines." *Walker, M.S.S.*

Cosemia? palparia, Walker, M.S.S., n. sp. Locality not recorded.

"*Mas.* Cinerea fusco-conspersæ; palpi porrecti, longi, compressi, pilosi; alæ anticæ fascia obscure fusca lata albido marginata, extus undulata, intus postice dilatata, linea exteriore indistincta angulosa obscure fusca, gutta subapicali punctisque marginalibus nigris, fimbria albo punctata."

"*Male.* Cinereous, brown-speckled. Palpi porrect, long, compressed, pilose, extending rather far beyond the head. Forewings with a broad dark brown band which is undulating, whitish-bordered and slightly angular on the outer side, and is diffuse on the inner side, except hindward, where it is dilated and whitish bordered, and forms a prominent angle; space near the exterior side of the band whitish, succeeded by an indistinct zigzag dark brown line, which is accompanied by a brown spot on each border; subapical dot and marginal points black; fringe with white points. Hindwings with a blackish marginal line. Length of the body 5 lines; of the wings 14 lines." *Walker, M.S.S.*

Cidaria lactispargaria, Walker, M.S.S., n. sp. Abundant at Sixteen-Island Lake, May.

"*Mas.* Pallide fusca; palpi brevissimi; alæ linea alba undulata informe incompleta nigricante notata, punctis marginalibus nigris; antice litura discali nigricante, linea interiore nigra undulata."

"*Male.* Pale brown. Palpi very short. Abdomen and hindwings cinereous, brown speckled; the former with a compressed apical tuft. Wings with an undulating irregular, incomplete blackish marked white line, and with black marginal points. Forewings with the middle part somewhat darker, with a blackish discal mark, and with a black interior, irregular, undulating line. Length of the body 5 lines; of the wings 13 lines." *Walker, M.S.S.*

Pyralidina.—Family, Botydæ, *Guén.*

Botys magniferalis, Walker, M.S.S., n.sp. Sugar-bush Lake, Montcalm, June.

"*Mas.* Alba, subiridescens; palpi extus fusci; thorax fusco subconspersus; abdomen fusio fasciatum; alæ anticæ fusco variæ, maculis duabus magnis anticis fuscis, fimbria fusco inter lineata; posticæ fusco conspersæ."

"*Male.* White, slightly iridescent. Palpi brown on the outer side. Thorax slightly speckled with brown. Abdomen with irregular dark brown bands. Forewings excepting the discal part mottled with brown; two large brown spots extending from the costa to the disk, the inner one narrower than the outer one and not half its length; fringe diffusedly interlined with brown. Hindwings irregularly speckled with brown. Length of the body 5 lines; of the wings 14 lines." *Walker, M.S.S.*

Eubulea tertialis, Guén. This is the species mentioned at p. 95 of Volume V, as so abundant on Raspberry blossoms in July, at Bevin's Lake, Montcalm.

NOTE.—The new species mentioned above without descriptions, will probably be described in the British Museum Catalogues of the Geometrina now publishing.

The following three species of *Neuroptera* were determined for me at the British Museum:—

Polystæchotes nebulosus, Fabr. (*sticticus*, Buin.) and *Osmylus validus*, Walker. This fine insect is very numerous in August in the present district, and also about Montreal near water. It flies at all hours of the night, often dashing into one's face, and with its large soft, gauzy wings communicates a very unpleasant sensation, especially to a solitary watcher by a lonely camp fire in the backwoods. It closes its wings and falls head foremost to the ground immediately it strikes against any object, and remains motionless for a few seconds before again taking wing. It is much attracted to light.

Hermes maculatus. Common, flying by day in July the whole way up the Rouge. I have also taken it at Sorel, and it occurs in the Eastern Townships. It generally hovers over the water.

Panorpa subfurcata. Observed at Bevin's Lake, Montcalm; Huckleberry Rapids, De Salaberry; and Hamilton's Farm; July to September.

Although the *Diptera* are so very numerous, not only in species but in individuals, that they are without exaggeration the worst evils of back-woods life, witness the various species of "Deer-fly" (*Tabanus*), Golden-eye (*Chrysops*), "Black-fly" (*Simulium*), Mosquito (*Culex*), and "Sand-fly," all of which are more or less annoying. I am sorry to say I collected but a few specimens some of which were destroyed and most of the others I have been unable to determine.

The *Hymenoptera* collected will be noticed elsewhere.

Exeter, Devonshire, June 2nd, 1860.

ARTICLE IV.—*On the occurrence of Freshwater Shells in some of our Post Tertiary Deposits.* By ROBERT BELL.

(Presented to the Natural History Society of Montreal.)

The various deposits described in the following paper are of different ages and have been formed under very different circumstances, but are arranged under the same head for the sake of convenience.

MONTREAL.

Early in the spring of 1858 I accompanied Mr. D'Urban, who has done much for the cause of Natural History in Canada, on several excursions to collect fossils at the localities in the vicinity of Montreal where drift shells had been discovered. In examining the sides of Mr. Peel's clay pits, which are excavated in the 120 feet terrace, we discovered a few specimens of *Limnæa caperata*, Say, in place, in a thin layer of sand immediately above the Leda clay and more than three feet below the surface of the ground, which is level at the place. In the same bed with these fresh water shells *Saxicava rugosa*, *Tellina grœnlandica*, *Mya arenaria*, *Mya truncata* and *Mytilis edulis* are associated; and in the clay immediately underlying it *Leda Portlandica* was found, but not in any abundance.

About the same time that this Limnæa was found at Mr. Peel's

brick yard, I received a fine specimen of *Limnæa umbrosa*, Say, from Sir Wm. Logan, who obtained it from the thin bed of sand at the same locality. A *Cyclas* and *L. umbrosa* were found by Dr. Dawson amongst marine shells thrown out of a ditch on Logan's Farm.* I have collected specimens of the latter at the same place and believe them to be contemporaneous with the marine shells.

I might mention that the ponds on the highest part of Montreal Mountain, about 700 feet above the level of the sea, teem with *Limnæa umbrosa* and *L. caperata*, besides numerous other species of our common fresh water Gasteropods. Ponds, with all these species living in them, may have existed in the same situation when Montreal Mountain was an island in the sea which covered the surrounding plain, and from them the rills running down its sides may have carried the specimens found in the sand which was then being deposited around its base.

Green's Creek.

Green's Creek enters the Ottawa in the Township of Gloucester, on the south side, about ten miles below Ottawa City. Here, the Leda clay has afforded a larger number and more interesting variety of fossils than at any other locality. At low water, which is generally in the month of September, the shore of the Ottawa for about two miles from the mouth of the creek upwards, is strewn with nodules of all manner of curious shapes washed from the base of the steep bank of clay which rises from high water mark.

In looking over the collection of nodules from this locality in the Museum of the Geological Survey, I found two specimens of *Limnæa stagnalis*, one of our commonest living species. Both had been partially filled with clay, now a hard stone, while they still retained their original shape. With the exception of the splendid *Limnæa megasoma*, which inhabits the Ottawa valley, this is the largest species in Canada. It was called *L. jugularis* by Say, but is identical with the European *L. stagnalis*. One meets with these shells in almost every warm marsh or pond on the south side of the Ottawa, and it is interesting to know that their progenitors lived in this country while the Leda clay was being deposited and a deep sea covered their present abode.

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* Canadian Naturalist, vol. iv. p. 36, vol. 11, p. 422.

Not only have marine shells and this fresh water species been found at Green's Creek, but also the remains of two seals, three kinds of fish, leaves, wood and nuts of land plants, three or more species of marine algæ and specimens of *Asteracanthion polaris* Müll, the most abundant starfish now inhabiting the Lower St. Lawrence, and future researches at this locality will no doubt add many more fresh water, as well as marine species, to our Post Pliocene fauna.

Terraces around Lake Ontario.

On the south side of Lake Ontario a remarkable ridge* composed of loose materials, extends from Sodus in Wayne County westward to Lewiston on the Niagara River, a distance of 100 miles, and a continuation of the same ridge has been traced to the head of the lake. The general contour of this "Lake Ridge," as it is called, is parallel to the present shore of the lake, its extreme variations being three miles at its least and eight at its greatest distance from the shore. A carriage road runs along its summit, the general elevation of which is so uniform, that when the road is tolerably straight, a traveller can be seen as far as the eye can reach. A remarkable feature of this ancient boundary of the lake is that it declines more or less on the inland, as well as the lake side, thus constituting a true ridge, which damming the surface water, forms marshes on the upper side. This fact can be no objection to the supposition of its marking a former boundary of the lake, for we find similar ridges now forming along low exposed shores. The rarity of shells in it, is perhaps as a circumstance in favour of the supposition of its being of fresh water, and not marine origin, as shells are very scarce along the open shores of the great lakes, and one might search a long time in similar ridges now forming without finding any.

The elevation of the summit of the ridge above Lake Ontario opposite Middleport is 185 feet, opposite Albion and Brockport it is 188 feet. The distance comprised within these three observations is thirty miles, in which the elevation of the ridge varies only three feet; in Wayne County it is estimated at 200 feet. Fragments of wood, shells, &c., are found embedded in it; the shells were not collected by Mr. Hall himself but he has no doubt

* The facts here given in regard to the "Lake Ridge" are derived from Hall's Geology of New York, Part IV.

of their occurrence. In his annual report of 1838 he remarks that *Uniones* are said to have been found in the ridge. Should the shells of this deposit prove to be of fresh water origin, and since no marine shells have been found in it, we might be induced to believe that Lake Ontario once stood far above its present level, and that a barrier which kept it at that level has since been removed; but on the contrary, as there is no actual proof that such a barrier did exist, we have reason to conjecture that it was formed while the sea stood at that level. Allowing the water by which the Lake Ridge was thrown up to have been 175 feet over the present level of Lake Ontario, we should have about 410 feet as its elevation above the present sea level; this corresponds exactly with that of the littoral deposit in Nepean on the Ottawa, in which Sir Wm. Logan has found marine shells, and it would not be surprising if future researches prove them to be contemporaneous—perhaps also with the terrace on the back of Montreal Mountain which is 50 or 60 feet higher,—for littoral deposits at considerable distances apart may be of the same age though at different elevations, as these differences may be due to an unequal amount of upheaval or to a difference in the heights to which the tides rose.

One of the numerous terraces which run along the north side of the lake will no doubt be found to mark an elevation corresponding to that of the "Lake Ridge" on the south; probably the "Pine Ridge" which is so well marked is the one. The late Mr. Roy, who long ago levelled the terraces behind Toronto, gave 108, 208, 280, 308, 344, 420, 680 and 762 feet as the elevations there of ancient beaches above Lake Ontario.

Dr. Dawson the other day showed me two specimens of a *Melania* and one of *Unio ellipsis* from a sandy deposit not far from Toronto.* They are described as having been found immediately above the Silurian rock in the drift about five miles from the Asylum. Both the *Melanias* are filled with sand but on the back of the *Unio* there is a thin layer of clay which again is impregnated with sand. The deposit from which these shells are derived may be of the same age as the ridge on the other side of the lake.

Professor Chapman informs me that he has collected specimens of a *Planorbis* in sand and gravel about 46 feet above the lake in the neighbourhood of Belleville.

* Collected by B. Workman, Esq., M.D.

Although some of the lower terraces behind Toronto might have been formed by the lake when at a greater elevation, the higher ones were doubtless formed during the period of the glacial drift.

I will mention a circumstance which may be one reason for inferring that Lake Ontario was filled with fresh water at the time when the sea stood at one of the best marked zones of the Post Pliocene formation to the eastward. It is well known that the very common little bivalve *Tellina grœnlandica* delights in salt water which is largely mixed with fresh and is most abundant in friths or bays where rivers enter the sea. In descending the St. Lawrence from Quebec, it is the first marine shell one meets with and is extremely abundant when the upper limit of other marine species is reached. When the salt water extended up the valley of the St. Lawrence to some point between Montreal and Kingston, we should naturally expect the same state of things to have existed. Now, in the drift deposits at Prescott, at about 250 feet above the sea, *Tellina grœnlandica* is very abundant and I did not observe any other species; from this fact, and considering the situation of the locality, it appears evident that the estuary was here diluted with fresh water when the sea stood at this level, but the argument is open to many objections.

Niagara Falls.

In 1859 an opportunity was afforded me of examining the ancient bed of the Niagara River near the Falls. Between the Clifton House and the toll-gate below, a deposit of gravel and sand, rich in fluviatile shells, occurs between the ancient bank of the river, and the cliff overhanging the present gorge. At a spot on the road-side where a quantity of the sand and gravel had been excavated, I collected the following species:—

1. *Planorbis bicarinatus.*
2. *Physa heterostropha.*
3. *Limnæa caperata.*
4. " *stagnalis.*
5. *Melania Niagarensis.*
6. " *conica.*
7. " *acuta.*
8. *Paludina decisa.*
9. *Amnicola porata.*
10. *Unio gibbosus.*
11. " *complanatus.*
12. " *ellipsis.*
13. " *rectus.*
14. *Margaritana marginata.*
15. *Cyclas similis.*
16. *Psidium dubium?*

A portion of a land snail, probably *Helix albolabris* was also

found. Many of the bivalves were perfect, having the valves closed, and from the position in which they were found, appeared to have lived on the spot where they are buried. These shells may have lain here for thousands of years, although their geological date is extremely recent.

Similar terraces occur on Goat Island, and along the American side of the river from the Falls to the whirlpool. A mastodon's tooth was found in this fluviatile terrace opposite Goat Island, at a depth of nine feet below the surface, but it does not follow from this, that the mastodon lived at the time of its formation, for the tooth might have been washed from an older deposit. These terraces being all on the same level, and the *Uniones* occurring in them in the position in which they had lived, are facts which imply that they were once connected so as to form a continuous stratum, extending over the position occupied by the present gorge, and also that they have been deposited in a tranquil widening of the river, like that between Chippawa and Buffalo. They also afford a conclusive proof that the Falls have receded. These terraces are described by Hall, Lyell and Ramsay.

Terraces around Georgian Bay.

The more inaccessible parts of the Province have naturally received less of the attention of scientific men, than those in the vicinity of her cities or along her great thoroughfares. I am not aware of anything having yet been published in regard to the lake terraces of the region under notice, with the exception of a paper by Sandford Fleming, C. E., on "The Valley of the Nottawasaga,"* from which I extract the following:—

"There are appearances in various parts of this region which lead us to infer that the waters of Lake Huron like those of Ontario, formerly stood at higher levels than they at present occupy. Parallel terraces and ridges of sand and gravel can be traced at different places winding round the heads of bays and points of high land with perfect horizontality, and resembling in every respect the present lake beaches; one of them particularly strikes the attention in the Bay of Penetanguishene, at a height of about 70 feet above the level of the lake; it can be seen distinctly on either side from the water, or by a spectator standing on one bank while the sun shines obliquely on the other, so as to throw the deeper parts of the terrace in shadow. The accompanying section, sketched† from a cutting a little below Jeffrey's tavern, in the Village of

* Read before the Canadian Institute in 1853, and published in the first volume of the Canadian Journal.

† This sketch resembles a cross section of a side-hill road, where the earth has been excavated on the upper and thrown to the lower side.

Penetanguishene, will serve to show the manner in which the soil has been removed from the side hill and deposited in a position formerly under water, by the continued mechanical action of the waves. Not only does the peculiar stratification of the lower part of the terrace confirm the supposition that it was deposited on the shore of an ancient lake, but the fact that such excavations have been made in this land-locked position, where the waves could never have had much force, goes far to prove that the lake stood for a long period at this high level.

"Another ancient beach mark about 15 miles inland, and as far as yet ascertained, about the same level as the one at Penetanguishene, can be traced for a long distance in the township Tosorontio. It passes through the tract of burnt land already described, the soil of which being pure sand, in all probability formed the shoals of a lake extending to the north and east, the outline of which is approximated by the dotted line* marked from 70 to 80 feet high on the accompanying map. Nor are these the only traces of old lake beaches met with in this region, although the dense forest nearly everywhere covering the surface is a great impediment to their easy discovery. In the Township of St. Vincent, near the village of Meaford, besides a very conspicuous one, corresponding in level with those already mentioned, several others of lesser note are found at various heights; at Owen Sound, also, they are remarkably well defined; while Cape Croker, on the western side of Georgian Bay, viewed even from a distance and the well remembered shape of the Giant's Tomb, on the eastern, show striking evidences of having been acted on for ages by the storms of Lake Huron, when at a higher level.

"It has been said that some of these terraces are estimated at 70 or 80 feet feet above the level of the lake; by drawing a contour line coinciding with this height around the lower part of the valley, it is found that the high ridge of sand now in some parts blown up into dunes near the mouth of the River (Nottawasaga), will form a narrow neck of land (supposing the lake at its former level), stretching across from shore to shore, and resembling in many respects the "Burlington Beach," on Lake Ontario, and also "Fond-du-Lac," on Lake Superior; like the first it encloses a bay of considerable depth of water, but of far greater area. That this ridge has been formed in a manner precisely similar to those two, by the sand washed from the adjoining shores, there is great probability, in fact there is good reason to believe that the same natural agents, at present in active operation moving the outlet of the river eastward, have also formed this upper ridge by transporting the materials of which it is composed, from the base of the escarpment in Collingwood.

"In attempting to arrive at the geological age of these ancient beaches, it will be necessary to show whether their position, at a consi-

* This line encloses a subtriangular space, having one corner in the north of Nottawasaga, another in the centre of Essa, and the third in the north-east corner of Vespra.

derable height above the level of the lake may be attributable to a gradual elevation of the land or to a subsidence of the water. The last hypothesis seems the most tenable, since the first would involve a local upheaval only, and an inclination of the plane of the terraces at variance with their apparent horizontality. Should further researches prove the existence of terraces or other indications of old beaches on the western margin of Lake Huron corresponding in height with those discovered along the eastern shore, the supposition that the level of the water has been lowered by the wearing away of some barrier will be strongly supported; and if this be allowed as a reasonable explanation for these geological monuments, we have then, by drawing contour lines coinciding with their level the means of discovering the probable position of this barrier. From all that I can learn regarding the relative levels of the country these lines would pass over the peninsula between Lakes Huron and Erie at some distance inland from the River St. Clair and would if continued eastward along the shores of Lake Erie fall within the summit of the neck of land through which the chasm of the Niagara River is cut."

The northern part of the Township of Nottawasaga is situated on the extensive sandy plain above alluded to, which was no doubt formerly covered by an extension of Georgian Bay to the south-eastward. The whole has a general slope up from the bay, but here and there a ridge of gravel or coarser sand interrupts its general uniform aspect. Hurontario Street, running from Collingwood Harbour almost due south through the township, was carefully levelled by Wm. Gibbard, C. E., and it appears from his profile section of the street, that from Collingwood to the north side of the Pretty River at the Village of Melville or Nottawa Mills, a distance of two and a half miles, the ground rises very regularly from the edge of the water to an elevation of 138 feet, or at the rate of about 55 feet per mile. At the Pretty River a change begins both in the character of the surface and in the rate of its inclination, which continues regularly for three and a half miles further at 47 feet per mile. Thus, at a distance of six miles from the present shore, the surface has attained an elevation of more than 300 feet above the level of the lake; beyond this it rises irregularly and much more rapidly. It is evident that the bank of sand and gravel on the north side of the Pretty River continued for a long time to be the shore of the lake. The layers of sand and gravel are arranged exactly as on a modern beach, and among them I noticed several thin irregular beds of a light grey or white colour, composed principally of carbonate of lime. In the cutting through the top of this ridge the common land shells *Helix al-*

bolabris, *H. tridentata*, *H. Sayii*, *H. alternata*, and *H. fuliginosa* were collected, at from three to four and a half feet below the surface.

About a mile south of Collingwood, a shallow cutting for the road, exhibits the arrangement of the beds of sand and gravel, which at the base of the exposure dip southward at an angle of 35° and are overlaid to the surface by unconformable horizontal layers. Here, from the surface to a depth of three feet, *Planorbis trivolvis* and *Helix fuliginosa*, *H. tridentata* and *H. thyroides?* were found. The summit of this rise is 78 feet above the level of the lake, and from its plotted section appears to have been thrown up by the waves when the edge of the lake ran along the base of its northern slope.

There are a few specimens of *Melania conica* in the Geological Museum, from a railway cutting in sand near Collingwood.

The greater part of the town of Owen Sound is built on a loose deposit of gravel and fine sand at the head of a long arm of the Georgian Bay of the same name. The flat formed by this deposit slopes gradually up from the head of the bay towards the falls of the Sydenham River, which has cut its way through it, and is bounded on either side by terraces of Silurian limestone or marl. Fresh water shells were observed in abundance wherever a section of the sand was exposed, and also, in one place, *Helix alternata* the most abundant land shell on the shores and islands of Lake Huron.

The following species were collected in different places in the most central part of the town. One of these, on the bank of the river was about nine feet above the level of the lake; the others appeared to be a little higher.

1. *Limnæa umbrosa.*
2. *Planorbis campanulatus.*
3. " *bicarinatus.*
4. " *parvus.*
5. *Melania acuta.*
6. " *Niagarensis.*
7. *Melania conica.*
8. *Paludina decisa.*
9. *Valvata sincera.*
10. " *tricarinata.*
11. *Amnicola porata.*
12. *Cyclas similis.*

About a mile south from the mouth of the river, or following the upward course of the valley, the road is cut through a slight elevation in this lacustrine deposit and here also fresh water shells were found embedded in the sand, but neither the species nor individuals

were so numerous as in the same deposit nearer the head of the bay. I had no means of ascertaining the elevation of this spot above the lake, but it seemed to be more than 30 feet and the shells bore evidence of great antiquity.

The terraces before alluded to as bounding this flat are capped with fine sand and their summits appeared to exceed 80 feet above the level of the lake. They are well marked and extend for miles along each shore of the Sound. At Peiett's Harbour, or the French Village on the west side of Owen Sound and about twelve miles from the town of the same name, two steep and very well marked lake terraces rise, one above the other, near the water's edge. They are both composed, as far as I examined them, of shingle mixed with a little silt. The summit of the upper one appeared to be about 100 feet above the lake and is in all probability the continuation of the upper terrace running round the head of the Sound, while the lower one corresponds to that on which the town is built.

When Lake Huron was at a sufficient elevation to form the higher of these terraces, it was probably connected by a wide expanse with Lake Erie, which is also proved to have stood at this high level from the fact of a ridge holding fragments of decayed wood and fresh water shells, running along its southern side at an elevation of 150 feet above its present level.

Montreal, *Feb. 4th*, 1861.

ARTICLE V.—*Professor Guyot on the Physical Geography of the Appalachian Mountain System.*

The great Appalachian backbone of Eastern America though much visited in some of its peaks by tourists, penetrated by many roads, and stretching through the midst of a civilised country, has hitherto been little known to Physical Geographers in its details. Prof. Guyot has made it a special subject of study since his arrival in America; and since 1849 has devoted his summer excursions to the accurate barometrical measurement of its elevations at various points throughout its whole length. The results, including details of the methods of observation employed, and a table of the heights of all the principal peaks, table-lands and gaps, are published in Silliman's Journal; from early sheets of

which kindly forwarded to us, we extract the following general conclusions as to the physical structure of the chain.

"The upheavals of ancient rocks which constitute this well connected physical structure, for which, as a whole, it is proper to retain the common name of the Appalachian system, extend in an undulating line thirteen hundred miles in a mean direction of N. E. to S. W., from the promontory of Gaspé upon the Gulf of St. Lawrence to Alabama, where the terminal chains sink down and are lost in the recent and almost horizontal strata of the cretaceous and tertiary formations which cover the greater portion of the surface of this state. This long range of elevations is composed of a considerable number of chains, sensibly parallel to each other, occupying more particularly the eastern part which faces the ocean, and of an extended plateau which prevails towards the west and northwest and descends gradually towards the inland valleys of the St. Lawrence, the lakes Erie and Ontario and the Ohio River.

The base on which this large belt of mountains rests, and which may be considered as bounded by the Atlantic Ocean on one side and by the Ohio and St. Lawrence Rivers on the other, is formed, in the east, by a plain slightly inclined towards the Atlantic. The width of that plain, in New England, does not vary much from fifty miles. Near the mouth of the Hudson, however, in New Jersey, it nearly disappears, but gradually increases towards the south to a width of over two hundred miles. Its elevation above the sea, at the foot of the mountains, is in New England, from 300 to 500 feet. From the neighborhood of the bay of New York, where it is nearly on a level with the ocean, it rises gradually towards the south to an altitude of over 1000 feet. On the west the table-lands which border upon the Ohio River, and which may be considered as the general base of the system, preserve a mass-elevation of a thousand feet or more, in the thickness of which the river bed is scooped out to the depth of from 400 to 600 feet, thus reducing the altitude of the Ohio River full one-half from that of the surrounding lands.

The vast belt of the Appalachian highlands forms the marginal barrier of the American continent on the Atlantic side, and determines the general direction of the coast line, which in general, runs parrallel to the inflections of its chains with remarkable regularity. This system, composed of a series of corrugations tolerably uniform, does not, like the Alps, or the other great systems of fracture, have a central or main axis, to which the secondary chains are subordinated. But it is properly compared to the system of the Jura, for it is composed like that of a series of long folds, or chains, which run parallel to each other, often with great regularity. In the same part of the system the general height of the chains is sensibly equal and their summits show neither many nor deep notches. In the middle region, especially in Pennsylvania and New Jersey, they present the appearance of long and continuous walls, the blue summits of which trace along the horizon a uniform line

seldom varied by any peaks or crags. In the extreme northern and southern portions, however, this character is considerably modified. There the system loses very much of its uniformity and its physical structure becomes far more complicated; the form of simple parallel ridges almost entirely disappears.

There is one feature of the Appalachian system which distinguishes it from the ranges of the Jura; it is the well marked division into two longitudinal zones of elevation, one turned towards the shores of the Atlantic, in which the form of parallel chains just spoken of predominates, and the other turned towards the interior, which is composed of elevated and continuous plateaus, descending from the summit of their eastern escarpment, in the centre of the system, in gentle stages towards the basins of the lakes and the valley of the Ohio. Occasionally minor chains, very little elevated from their base, wrinkle the surface of the table-lands. Their parallelism with those of the eastern mountainous zone shows that they are but the last undulations due to the action of the same forces which have upheaved and folded that region, and which have raised at the same time, the mass of these more uniform plateaus. Thus when from any point we traverse the Appalachian system from the Atlantic, we encounter first a plain more and more undulated and gradually ascending to the foot of the mountains; then a mountainous zone with its ranges parallel and its valleys longitudinal; at length a third zone of uniform plateaus slightly inclined towards the northwest, and cut with deep transverse valleys.

Another feature not less conspicuous characterizes the region of corrugations properly so-called. This is a large central valley which passes through the entire system from north to south, forming, as it were, a negative axis through its entire length. This is what Mr. Rogers calls the Great Appalachian valley. At the north it is occupied by lake Champlain and the Hudson river; in Pennsylvania it bears the name of Kittatinny or Cumberland valley. In Virginia it is the Great valley; more to the south it is called the valley of East Tennessee. At the northeast and at the centre its average breadth is fifteen miles; it contracts in breadth towards the south, in Virginia, but reaches its greatest dimensions in Tennessee where it measures from fifty to sixty miles in breadth. The chain, more or less compound, which borders this great valley towards the southeast is the more continuous and extends without any great interruption from Vermont to Alabama. In Vermont it bears the name of Green Mountains, which it retains to the borders of New York; in the latter State it becomes the Highlands; in Pennsylvania, the South Mountains; In Virginia the Blue Ridge; in North Carolina and Tennessee the Iron, Smoky, and Unaka Mountains. On the northwest of the great valley between the latter and the borders of the plateau parallel there extends a middle zone of chains separated by narrow valleys, the more continuous of which is the range which bounds the central valley. This zone has a variable breadth in different parts of the system, and the number of chains which compose it is by no means uniform throughout.

Although these features are common to the Appalachian system throughout its entire length, nevertheless it may be divided from north to south into three *divisions* which present very remarkable differences of structure. Passing the eye over the physical chart which accompanies this article we at once distinguish in the longitudinal extent of the Appalachian system two principal curvatures, the one at the north from Gaspé to New York, the concavity of which is turned towards the southeast; the other at the centre, from the Hudson to New River in Virginia, with its concavity also towards the southeast; the third from New River to the southwest extremity of the system, the direction of which is nearly straight or forming a gentle curve concave towards the northwest. These three divisions, diminishing in extent, from the north to the south, are well marked; at the north, by the deep valleys of the Mohawk and the Hudson, which break through the Appalachian system to its base and across its entire breadth; at the south, by the New River whose deep valley with vertical walls also separates regions whose orographic characters present remarkable differences.

The *northern division* is much the most isolated; it is geologically the most ancient, since its upheavals appear coeval with the Silurian and Devonian epochs, and are thus much anterior to the rest of the system, which only emerged after the deposit of the carboniferous rocks which it has elevated. Four hundred feet more of water would separate all the vast territory of the northern division from the American continent. One hundred and forty feet would convert into an island all New England and the British possessions as far as Gaspé; for the bottom of the valley occupied by Lake Champlain and the Hudson does not in any part exceed this level.

I distinguish in this northern portion three physical regions; 1st, the triangular plateau of the Adirondack, with its mountain chains more or less parallel, between Lake Champlain and the St. Lawrence, Lake Ontario and the Mohawk: 2nd, New England, with the two swells of land separated by the deep valley of the Connecticut, and forming the base of the Green and White Mountains: 3rd, the northern region, with the prolongation, towards the northeast, of the same features of relief from the source of the Connecticut through Maine into Canada and New Brunswick to the promontory of Gaspé and the Bay of Chaleurs.

The *middle or central division* extends in length about 450 miles. The eastern region, or region of folded chains, at first very narrow about New York, presents towards the centre, in Pennsylvania, its greatest breadth which again diminishes towards the south. It is composed of a considerable number of chains much curved towards the west, and remarkable for their regularity, their parallelism, their abrupt acclivities, the almost complete uniformity of their summits, and their moderate elevation, both relative and absolute, which varies from 800 and 1500 to 2500 feet. The chains, however, increase in elevation towards the south, while they become more numerous and more indented. In the Peaks of Otter, in Virginia, they attain to 4000 feet.

The western region, or the region of plateaus, is quite narrow in the

southern part, but acquires towards the north the greatest breadht which it attains in any part of the Appalachian system. Its highest terraces occupy all the State of New York south of the Mohawk, and a considerable part of Pennsylvania and culminate in the plateaus in the neighborhood of Lake Erie, where the mean altitude of the plateau reaches 2000 feet, the valleys preserving a height of 1500 feet, while the hills reach 2600 feet.

This table land forms a remarkable water-shed from which the waters descend by the Susquehanna into the valley of the Chesapeake and the Atlantic Ocean, by the Genesee and St. Lawrence to the same ocean, and by the Alleghany and Ohio to the Gulf of Mexico. The Susquehanna thus starts from Lake Erie at the extreme western border of the plateau, and runs across all the Appalachian system and its mountain-ranges to its eastern base. More to the southward the eastern escarpment of the plateau divides, as far as the sources of the Potomac, the waters of the Atlantic coast from those of the Gulf of Mexico. It is the same escarpment which bears the local name of Alleghany Mountain, a name which continues to be applied, south of the waters of the Potomac, to the dividing ridge along the sources of the various branches of James River, and even to the irregular hills which form a water-shed between the waters of the Upper Roanoke and New River, across the Great Valley, near Christiansburg. Through all this middle region the name of Blue Ridge is applied to the main eastern chain which separates the Great Valley from the Atlantic slope, and which is cut by all the rivers which flow out of it.

The *southern division*, from New River to the extremity of the system, is much the most remarkable for the diversity of its physical structure and its general altitude. Even the base upon which the mountains repose is considerably elevated. Although the elevation of the Atlantic plain at the eastern base of the mountains is only 100 to 300 feet in Pennsylvania, and 500 in Virginia near James River, it is 1000 to 1200 feet in the region of the sources of the Catawba. In the interior of the mountain region the deepest valleys retain an altitude of 2000 to 2700 feet.

From the dividing line in the neighborhood of Christiansburg and the great bend of New River the orographic and hydrographic relations undergo a considerable modification. The direction of the principal parts of the system is also somewhat changed. The main chain which borders the Great Valley on the east, and which more to the north, under the name of the Blue Ridge, separates it from the Atlantic plain, gradually deviates towards the southwest. A new chain detached on the east, and curving a little more to the south, takes now the name of Blue Ridge. It is this lofty chain, the altitude of which, in its more elevated groups, attains gradually to 5000 and 5900 feet, which divides in its turn the waters running to the Atlantic from those of the Mississippi. The line of separation of the eastern and western water, which, to this point, follows either the central chain of the Alleghanies, or the western border of the table-land region, passes now suddenly to the eastern chain

upon the very border of the Atlantic plain. The reason is that the terrace which forms the base of the chains, and the slope of which usually determines the general direction of the water courses, attains here its greatest elevation, and descends gradually towards the northwest. The base of the interior chain which runs alongside the Great Valley is thus depressed to a lower level, and though the chain itself has an absolute elevation greater than that of the Blue Ridge, the rivers which descend from the summits of this last, flow to the northwest towards the great central valley which they only reach, in southern Virginia and North Carolina, by first passing across the high chain of the Unaka and Smoky mountains through gaps of 3000 or 4000 feet in depth.

This southern division thus presents from southeast to northwest three regions very distinct.

The first is the high mountainous region comprised between the Blue Ridge and the great chain of the Iron, Smoky, and Unaka mountains which separate North Carolina from Tennessee. It commences at the bifurcation of the two chains in Virginia, where it forms, at first, a valley of only ten to fifteen miles in breadth, in the southern part of which flows New River; it then enlarges and extends across North Carolina and into Georgia, in length more than 180 miles, varying in breadth from twenty to fifty miles. The eastern chain, or Blue Ridge, the principal watershed, is composed of many fragments scarcely connected into a continuous and regular chain. Its direction frequently changes and forms many large curves. Its height is equally irregular. Some groups elevated from 5000 feet and more, are separated by long intervals of depression in which are found gaps whose height is 2200 to 3700 feet, often but little above the height of the interior valleys themselves with which they are connected. The interior, or western chain, is much more continuous, more elevated, more regular in its direction and height, and increases very uniformly from 5000 to nearly 6700 feet.

The area comprised between these two main chains, from the sources of the New River and the Watauga, in the vicinity of the Grandfather Mountain, to the southern extremity of the system, is divided by transverse chains into many basins, at the bottom of each one of which runs one of those mountain tributaries of the Tennessee, which by the abundance of their waters merit the name of the true sources of that noble river.

Between the basin of the Watauga and that of the Nolechucky rises the lofty chain of the Roan and Big Yellow mountains. The northwest branch of the Black mountain and its continuation as far as the Bald mountain separate the basin of the Nolechucky from that of the French Broad river. Between the latter and the Big Pigeon river stretches the long chain of the Pisgah and the New Found mountains. Further to the south the elevated chain of the Great Balsam mountains separates the basins of the Big Pigeon and the Tuckasegee; next comes the chain of the Cowee mountains between the latter river and the Little Tennessee. Finally the double chain of the Nantihala and Valley River mountains separates the two great basins of the Little Tennessee and

the Hiwassee. The bottom of these basins preserves in the middle, an altitude of from 2000 to 2700 feet. The height of these transverse chains is greater than that of the Blue Ridge, for they are from 5000 to 6000 feet and upwards; and the gaps which cross them are as high, and often higher than those of the Blue Ridge. In these interior basins are also found groups, more or less isolated, like that of the Black mountains, which, with the Smoky mountains, present the most elevated points of the system.

Here then through an extent of more than 150 miles, the mean height of the valley from which the mountains rise is more than 2000 feet; the mountains which reach 6000 feet are counted by scores, and the loftiest peaks rise to 6700 feet; while at the north, in the group of the White mountains, the base is scarcely 1000 feet, the gaps 2000 feet, and Mount Washington, the only one which rises above 6000 feet, is still 400 feet below the height of the Black Dome of the Black Mountains. Here then in all respects is the culminating region of the vast Appalachian system.

It is worthy of notice that in the Appalachian, as in many other systems of mountains, the culminating points are situated, neither near the middle, nor in the neighborhood of what may be called its central axis, which is here the Great valley, but near the northern and southern extremities, and on the eastern side, almost outside of the system. These culminating regions seem almost exceptions to the normal structure of the system. The high mountainous region of North Carolina which has just been described is, from the bifurcation of the Blue Ridge near the great bend of the New River, an additional fold which attaches itself on the east along the principal chain which bounds the Great Valley, just as the swell, which runs along the east of the Connecticut River, upon which the group of the White mountains is situated, is an additional fold attaching itself to the east of the normal chain of the Green mountains.

The second region of this southern division is the continuation of the Great Central Valley which is divided by a general swell of the land about the sources of the Holston, into two distinct basins, the one in Virginia, narrower and more elevated, which in the basin of the New River, rises gradually towards the south from an elevation of 1600 feet to 2600 feet; the other in Tennessee, where the valley widens to nearly sixty miles between the Smoky mountains and the Cumberland mountains, but where it has a mean elevation of not more than about 1000 feet, that is, only one-half of the height of the neighboring valleys in the mountainous region of North Carolina.

The third region is that of the plateaus which, in Tennessee, are reduced to a table land about thirty or forty miles wide, called the Cumberland mountains on account of the abrupt edges which it presents upon the east and the west, and which give to it the appearance of a mountain chain. Further north, in Virginia, the plateaus expand and fill a vast area to the west of the Clinch and the Cumberland mountains and extend over a part of Kentucky, the central portion of which, near Lexington, preserves an altitude of more than 1000 feet.

The rapid sketch here given shows that in a hypsometrical, as well as from a geological, point of view, and even to a certain extent from its physical structure, the Appalachian system seemed to be divided into two sections of nearly equal extent; a *northern section*, which is geologically more ancient, comprehending the northern division from the mouth of the Hudson to Gaspé; and a *southern section*, which is more modern, comprising the central and southern divisions, which are bound together by more than one characteristic common to both. The separation is distinguished by a remarkable general depression of all the altitudes of the eastern zone, or parallel mountain chains, a depression which attains its lowest point in New Jersey in the parallel of New York City.

Passing from this region, where the Blue Ridge and the Kittatinny mountains are but little more than 800 or 1000 feet high, and the Great valley 50 to 150 feet, the altitude in the northern section increases rapidly, but regularly, towards the northeast, where, almost in the same parallel, lat. 44° N., we find the culminating points at Mount Washington 6288 feet high in the White Mountains, Mount Mansfield 4430 feet in the Green Mountains, and Mount Tahawus or Mount Marcy 5739 feet, in the Adirondack group. Further north the Adirondack group terminates, and the Green Mountains lose somewhat of their continuity, but show here and there, as far as Gaspé, scattered groups of mountains which still preserve an elevation of 3000 or 4000 feet.

In the southern section the altitude increases from the northeast to the southwest with the same regularity but less rapidly, and it is only towards the extremity of the system in North Carolina that they attain their maximum elevation in the Black Mountains 6700 feet, and the Smoky Mountains 6660 feet. Here, as at the north, beyond the culminating points the general altitude is but little diminished until we arrive almost to the termination of the mountains."

INQUIRIES BY THE COLONIAL OFFICE RELATIVE TO CANADIAN NATURAL HISTORY.

GOVERNOR'S SECRETARY'S OFFICE,

Quebec, Dec. 22nd, 1860.

SIR,—I am directed by His Excellency the Administrator of the Government to transmit herewith a copy of a circular despatch from His Grace the Duke of Newcastle enclosing a series of questions relative to the Natural History of the British Colonies: and I am to request you will have the goodness to furnish His Excellency for the information of the Secretary of State with such answers as you may possess the means of giving.

I have the honor to be, Sir,

Your obedient Servant,

R. T. PENNEFATHER,

Governor's Secretary.

The Secretary Natural History Society, &c., &c., &c., Montreal.

DOWNING STREET.

28th June, 1860.

SIR,—With the view of ascertaining what materials may have been collected, or what works published, descriptive of the Natural History of the British Colonies, and relative also to some other Scientific subjects, I shall feel obliged to you to furnish me with such answers as you may possess the means of giving, within your Government, to the questions contained in the enclosed paper.

In any of the colonies where Scientific Societies are constituted, it will be advisable to make use of any aid which they may be so good as to contribute towards answering these enquiries.

I have, &c.,

(Signed,) NEWCASTLE.

Governor, the Rt. Hon. Sir E. Head, Bart.

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1. Have any works been published on the Botany of the Colony, and if so state the title of each work, the name of the author, and the year of publication adding, if requisite, any remark on the esteem in which it is held?

2. The same question as to Zoology.

3. The same question as to any works or published reports on Geology.

4. Does any public botanical garden exist in the Colony, and if so, briefly state the authority under which it is superintended and funds by which supported?

5. Is there any Zoological Museum, or any collection of living animals in a Zoological Garden, or any accredited set of correct drawings of the chief animals of the Colony?

6. Is there any Geological Museum, or any well known private collection of Geological specimens or unpublished records of Geological Surveys by competent observers?

7. What are the best known records, if any, of the Meteorology of the Colony, and are they published and easily procurable?

8. Are there any well known records of the phenomena of the tides, and if so, by what observers, and at what date?

9. The same question as to magnetical phenomena.

10. Have the latitude and longitude of the principal places on the coast been determined by careful celestial observations, and if so, by what observers and at what periods?

11. The same question as to the latitude and longitude of principal places inland.

N. B.—It is requested that the answers may be sent on a separate sheet prefixing to each the number of the question in this paper.

REVIEWS AND NOTICES OF BOOKS.

Contributions to the Natural History of the United States, by Louis Agassiz. Vol, 3.

This volume is more than a worthy successor to the two previous. The author is here completely on his own ground, and dealing with a group of animals peculiarly requiring such labour as he can perform better than any other naturalist, at least on this continent.

All dwellers by the sea side or visitors thereto, know the curious "jelly fishes" that swim lazily on the calm summer sea, or are cast on the shore by the storms of autumn. Yet few know the complex structures, the strange transformations, the peculiar habits of these little masses of living jelly, so delicate that they cannot be touched without injury, and having so little solid matter in their composition, that when dried on the beach they leave a mere pellicle on the sand.

Look for instance at the great blue jelly fish—the *Cyanea Arctica* of our shores, of which in the work before us, a series of admirable portraits is given. There it floats, six inches or a foot in diameter, its flat purple disk looking like a mould of jelly cast into the sea, but slowly and regularly contracting and expanding as the creature urges its way along. Behind trails a long tassel of red tentacles, capable of benumbing and entangling in their meshes any unwary fish, crustacean or mollusk, that may come in their way, and from the blistering properties of the poisoned thread or lasso cells with which they are filled, not harmless to thin skinned bathers. In the midst of the tentacles hangs the proboscis, expanding into a multitude of complex labial processes like frills of most delicate membrane; and at the base of the proboscis are the ovaries laden with the germs of a numerous progeny. A most singular creature truly, and presenting in its minute structures peculiarities quite as wonderful as in its external form;

as for instance in the numerous radiating tubes that serve it for veins and arteries, and in the little eye specks protected by complex lids, that are placed at the margin of the disk, and are its organs of vision.

The changes which these creatures undergo in the progress of their growth, are perhaps more wonderful than any other part of their history. The egg is hatched into a minute animalcule or *planula* of oval form, and with cilia or spontaneously moving threads on its surface. This fixes itself and becomes a *scyphistoma* or hydroid polyp of sack-like form, attached by the base, and stretching forth numerous tentacles from the mouth in search of food. The polyp multiplies by gemmation or budding, so that many may originate from one egg. When full grown it subdivides transversely and becomes a *strobila*, which resembles a number of cup-like polyps stuck one into the mouth of another. The strobila eventually breaks up and its separate parts become little freely swimming umbrella-shaped medusæ, called *ephyræ*, still quite dissimilar from the parent, to whose form they at length attain in process of growth. The earlier fixed states are passed through during winter, and at the bottom of the sea; and it is evidently the intention of these remarkable transformations that these creatures shall be capable of quickly filling the summer sea with an abundant brood in each succeeding year, much to the benefit no doubt of multitudes of roving fishes which make the Acalephs their prey.

The Cyanea thus roughly sketched may be regarded as a typical Acaleph; but the class embraces a variety of other forms, which are grouped by Agassiz in three orders, (1) *Hydroidea*, (2) *Discophora*, (3) *Ctenophora*, and it is to the second of these that our Cyanea belongs.

In the first and lowest of these orders we have the hydra-like polyps, with bodies hollowed into digestive sacks open at top and furnished with prehensile tentacles. Some are solitary and naked, others protected by horny or stony cells, and often grouped by gemmation or budding in complex branching structures, some of them small and resembling sea weeds, and others hard and calcareous like the true corals; others again are specialized into separate tentacular, reproductive and digestive polyps.

To understand these differences let us suppose an animal reduced to a mere digestive sack, with or without a horny case or cell, and having tentacles at top, and the power of producing

buds which may either remain attached or become free and found new colonies. This gives us the condition of the *Hydræ* and *Tubulariæ*. Next let us suppose that by budding, such a creature founds a complex branching structure, furnished with little horny cells, in each of which resides an animal contributing its quota to the general nourishment of the whole community. This is the condition of the *Sertulariæ*, *Campanulariæ*, &c., so abundant in the ocean, and forming so large a part of the zoophytes of the older naturalists. Further, these colonies of Hydroids, conspire to produce capsules, growing like fruits on their tree-like structures, and giving birth not to young polyps, but to little medusæ like the Cyanea, but simpler in structure, and which produce the eggs destined to form new colonies of Hydroids. It is here that we perceive the connecting link between the Hydroids and the true Medusæ.

But another modification of the hydroid structure is found in nature. Let us suppose that we have taken one of the complex branching structures last mentioned, and have cut off all the tentacles of the polyps, and taken out of the cells all the digestive sacks, and placed by themselves all the reproductive buds or capsules. Let us farther suppose that we have stuck these parts separately, and still alive, upon a living animal film spread over the surface of a shell or stone, or attached to the underside of a hollow gelatinous sack floating on the sea, so as to produce a complex group of separate tentacular, digestive, and reproductive parts, we shall then have the structures of the *Hydractinia*, that clothes some of the dead shells of our cabinets with a rough, unsightly film, and of the *Physalia* or Portuguese man-of-war, that floats like a purple and orange bubble on the tropical seas. Such are the general aspects of the Hydroidea.

In the second order, the, *Discophora*, already illustrated by the example of the *Cyanea*, the animal is greatly expanded laterally into a locomotive disk, to the edges of which the tentacles are attached.

In the third order, the *Ctenophora*, the parts become fewer but more complex, and the normal form is a transparent gelatinous ball, with the digestive cavity in the centre, the mouth in front, two pulsating vessels for circulating the blood at the sides, locomotive fins arranged in bands like the ribs of a melon, two long and complicated tentacles behind, where are also the eye specks. It is the last order that is specially described and illustrated in

the present volume, in a very full and satisfactory manner. As an example of a description interesting to every reader who takes pleasure in contemplating the "creeping things innumerable" that God has made in the sea, we quote the following description of the habits of the *Pleurobrachia rhododactyla*, a little ball of living jelly very common on our coasts in summer, and about the size of a large pea.

"The Ctenophoræ differ essentially from the Discophoræ. Both their form and organs of locomotion give them a different appearance. The Discophoræ, setting aside the various modifications arising from marked peculiarities of their outline, move like an umbrella, which, by alternately opening and shutting, would make its way under water by means of such movements. It is by the contraction of the body alone, or rather by the agency of the motory cells which form the mass, that motion is produced in these animals. Not so in the Beroid Medusæ, where, besides the action of the motory cells, the whole body, more or less spherical or ovate, compact or split at one end, is kept swimming by the flapping of innumerable small paddles arranged in vertical rows, like the ribs of an orange, upon the outer surface. These rows are generally eight in number, extending from one pole of their spheroid body to the opposite, like the meridians of an artificial globe. But, owing to the inequalities in the motions of their vertical flappers, and their radiated arrangement upon the more or less spherical body, these animals have a somewhat rotatory motion, unless the paddles move on all sides with perfect steadiness and uniformity.

'There can be scarcely anything more beautiful to behold than such a living transparent sphere sailing through the water, coursing one way or another, now slowly revolving upon itself, then assuming a straight course, or retrograding, advancing or moving sideways, in all directions with equal precision and rapidity; then stopping to pause, and remaining for a time almost immovable, a slight waving of some of its vibrating organs easily counterbalancing the difference of its specific gravity and that of the water in which it lives. So Pleurobrachia may appear at times, and so does it also appear when moving in a state of contraction. But generally, when active, it hangs out a pair of most remarkable appendages, the structure and length and contractility of which are equally surprising, and exceed in wonderful adaptation all I have ever known among animal structures. Two apparently simple, irregular, and unequal threads hang out from opposite sides of the sphere. Presently these appendages may elongate, and equal in length the diameter of the sphere, or surpass it, and increase to two, three, five, ten, and twenty times the diameter of the body, and more and more; so much so that it would seem as if these threads had the power of endless extension and development. But as they lengthen they appear more complicated: from one of their sides other delicate threads shoot out like fringes, forming a row of beards like those of the most elegant ostrich

feather, and each of these threads itself elongates till it equals in length the diameter of the whole body, and bends in the most graceful curves. These two long streamers, stretching out in straight or undulating lines, sometimes parallel, then diverging or variously curving, follow the motions of the main sphere, being carried on with it in all its movements, which are no doubt influenced by them to a considerable extent. Upon considering this wonderful being, one is at a loss which most to admire, the elegance and complication of that structure, or the delicacy of the colors and hues, which, with the freshness of the morning dew upon the rose, shine from its whole surface. Like a planet round its sun, or, more exactly, like the comet with its magic tail, our little animal moves in its element as those larger bodies revolve in space, but unlike them and to our admiration, it moves freely in all directions; and nothing can be more attractive than to watch such a little living comet as it darts with its tail in undetermined ways and revolves upon itself, unfolding and bending its appendages with equal ease and elegance, at times allowing them to float for their whole length, at times shortening them in quick contractions and causing them to disappear suddenly, then dropping them as it were from its surface so that they seem to fall entirely away, till, lengthened to the utmost, they again follow in the direction of the body to which they are attached, and with which the connection that regulates their movements seems as mysterious as the changes are extraordinary and unexpected. For hours and hours I have sat before them and watched their movements, and have never been tired of admiring their graceful undulations. And though I have found contractile fibres in these thin threads, showing that these movements are of a muscular nature, it is still a unique fact in the organization of animal bodies, that parts may be elongated and contracted to such extraordinary and extensive limits by means of muscular action. And what is so surprising, is not so much the sudden and powerful contraction which brings within the compact limits of a pin's head the whole mass of these tentacles that a moment before were floating so elegantly through such a great extent in the water, as the relaxation, which takes place in an absolutely passive manner; for when watching them we are suddenly struck with astonishment on finding that the tentacle which we expected to see drop to the bottom of the jar is still in organic connection with the body from which it hangs. Plate I. of my paper in the Memoirs of the American Academy represents some few of the attitudes of our Pleurobrachia in its various movements, one of which is reproduced in this work (Pl. II^a. *Fig.* 25); but I cannot find words to describe all the beautiful changes which the parts thus in motion assume in different attitudes. At one moment the threads, when contracted, seem nodose; next, when more elongated, these knots are stretched into the appearance of a spiral; next, the spiral, elongating, assumes the appearance of a straight or waving line. But it is especially in the successive appearances of the lateral fringes arising from the main thread that the most extraordinary diversity is displayed.

Not only are they stretched under all possible angles from the main stem, at times seeming perpendicular to it, or bent more or less in the same direction, and again as if combed into one mass; but a moment afterwards every thread seems to be curled or waving, the main thread being straight or undulating; then the shorter threads will be stretched straight for some distance and then suddenly bent at various angles upon themselves, and perhaps repeat such zigzags several times, or they may be stretched in one direction and bent at various angles in the plane of another direction; then they may be coiled up from the tip and remain hanging like pearls suspended by a delicate thread to the main stem, or like a broken whip be bent in an acute angle upon themselves with as stiff an appearance as if the whole were made up of wires; and, to complete the wonder, a part of the length of the main thread will assume one appearance and another part another, and pass from one into the other in the quickest possible succession: so that I can truly say, I have not known in the animal kingdom an organism exhibiting more sudden changes and presenting more diversified and beautiful images, the action meanwhile being produced in such a way as hardly to be understood. For, when expanded, these threads resemble rather a delicate fabric spun with the finest spider's thread, at times brought close together, combed in one direction without entangling, next stretched apart, and preserving in this evolution the most perfect parallelism among themselves, and at no time and under no circumstances confusing the fringes of the two threads: they may cross each other, they may be apparently entangled throughout their length, but let the animal suddenly contract, and all these innumerable interwoven fringes unfold, contract, and disappear, reduced as it were to one little drop of most elastic india-rubber. Week after week I have preserved these animals alive, and have never been tired of comparing again and again their changes in these thousand-fold developments of their appendages. I have called together those who felt the slightest curiosity for such objects to witness these phenomena, and have found them all interested to the utmost; and if I have anything to regret, it is not the time lost in this contemplation,—for the more I became familiar with the sight, the more was I impressed with its beauty, as I could contrast with the new forms presenting themselves before my eyes those different states with which I had been familiar before,—but the circumstance that the time was too short to trace such a connection between all the microscopic details of their structure and their functions, as would fully explain the latter; although I am aware that I have noticed many particulars which had not been observed before."

The following statements show that these creatures possess both vision and intelligence.

"Having recently seen myriads of these animals, it may not be superfluous to add, that all the various attitudes in which I have formerly seen them in confinement may be observed at one glance, when coming

suddenly upon a bank of them slowly drifting with the tide. Under these circumstances, however, they are not altogether at the mercy of the current; and it is curious to see how they resist its action by stretching their tentacles in a straight line in opposite directions and at right angles with the vertical axis of the body. I have also satisfied myself that they are aware of the approach of danger; for day after day I have seen thousands of them, which were quietly moving near the surface with the mouth wide open in search of food, suddenly turn upon themselves and with a quick jerk dive into the deep as my boat drew nearer and nearer. In fact, all Acalephs dive away from the surface when approached, and make accelerated motions to escape the net or glass dipped into the water to catch them. It seems as if they were endowed with the power of seeing, for noise has no effect upon them."

In the earlier chapters of the work much space is devoted to the classification of the Acalephs in general, and their place among the Radiates. This as held by the author may be represented by the following table, the groups being numbered from the lowest to the highest.

PROVINCE RADIATA.

Class I.	Class II.	Class III.
POLYPS.	ACALEPHS.	ECHINODERMS.
Order 1. *Actinoids.*	Order 1. *Hydroids.*	Order 1. *Crinoids.*
2. *Alcyonoids.*	2. *Discophores.*	2. *Asteroids.*
	3. *Ctenophores.*	3. *Echinoids.*

The only fairly disputable point in this table is the question, whether the Acalephs are not lower than the Polyps, a question on both sides of which much may be urged, but on which we are scarcely as yet inclined to agree with Prof. Agassiz.

One important point to geologists illustrated in this work is the affinity of the Millepore corals with the Acalephs rather than the Polyps, and the consequent probability that the orders *Tabulata* and *Rugosa*, which are the prevailing Palæozoic corals, and which have built up so many of our Silurian limestones, are also Acalephs. J. W. D.

'*The Romance of Natural History.*' By PHILIP HENRY GOSSE, F.R.S. 372 pp. demy 8vo; twelve plates. London: Nisbet & Co. Montreal: B. Dawson & Son.

(*From the Zoologist.*)

"There are more ways than one of studying Natural History.

There is Dr. Dryasdust's way; which consists of mere accuracy of defination and differentiation; statistics as harsh and dry as the skins and bones in the museum where it is studied. There is the field observer's way; the careful and conscienciously accumulation and record of facts bearing on the life-history of the creatures; statistics as fresh and bright as the forest or meadow where they are gathered in the dewy morning. And there is the poet's way; who looks at nature through a glass peculiarly his own, the æsthetic aspect, which deals, not with statistics, but with emotions of the human mind,—surprise, wonder, terror, revulsion, admiration, love, desire, and so forth,—which are made energetic by the contemplation of the creatures around him.

"In my many years' wanderings through the wide field of Natural History, I have always felt towards it something of a poet's heart, though destitute of a poet's genius. As Wordsworth so beautifully says.

> To me the meanest flower that blows can give
> Thoughts that do often lie too deep for tears.'

"Now this book is an attempt to present Natural History in this æsthetic fashion. Not that I have presumed constantly to indicate—like the stage directions in a play, or the 'hear, hear!' in a speech—the actual emotion to be elicited; this would have been obtrusive and impertinent: but I have sought to paint a series of pictures, tne reflections of scenes and aspects in nature, which in my own mind awaken poetic interest, leaving them to do their proper work."—*Preface.*

In these words does Mr. Gosse herald in his new publication, which is one of the most readable and agreeable of all his readable and agreeable books. The plan, if there be a plan, is most desultory—just that touch-and-go style which will secure the attention even of the most indolent reader: thus we leap from lions to butterflies; then plunge into brine and boiling springs; ascend the blue vaults of heaven after insects, and seek flying fish in beds and shoals of swimming fish in a parlour: next we enjoy a sojourn with serpents; then wander among groves of Cacti; and then mount the dragon tree of Oratava. Afterwards we are introduced to the whale and the elephant, the mammoth tree of California and life in a drop of water: to the jackal, the wolf and gorilla; and witness a fatal encounter with bees.

I have really enjoyed this book, it is most delightful; and although the mixture of subjects strikes one as rather heterodox in

a work on Natural History, there will be found a method running through the whole that strings the diverse subjects together, producing a pleasant combination, like beads of various size and colour.

Mr. Gosse patronizes the sea serpent, and pleads for him apologetically, but gives us without any hesitation the history of that arch-myth the tsetse; I believe, whenever a competent naturalist shall investigate the subject he will find the tsetse a disease, which the ignorant aborigines have falsely attributed to an insect but this is of no moment; difference of opinion detracts nothing from merit; and I may truly say that I never read a book with more real pleasure than the 'Romance of Natural History,' and I know none that I can more cordially and unhesitatingly recommend to my subscribers. I hope to return to it again and again for amusing and instructive scraps to insert in the pages of the 'Zoologist.'

Narrative of the Canadian Red River Exploring Expedition of 1857, *and of the Assinniboine and Saskatchewan Exploring Expedition of* 1858. By H. Y. Hind, M. A., F. R. G. S. Professor, Trinity College, Toronto. Vols 2, London, Longman; Montreal, B. Dawson & Son.

These explorations were undertaken for the purpose of ascertaining the practicability of establishing an emigrant route between Lake Superior and Selkirk settlement and of acquiring some knowledge of the natural capabilities and resources of the Valleys of the Red River and the Saskatchewan.

In pursuance of these objects the author has given in these volumes a minute, clear and most readable account of the districts through which his course lay. The work is really a credit to the Province. The two volumes are profusely illustrated with beautiful and artistic views of interesting localities. This book should be in all our public libraries and be carefully studied by those who interest themselves in the prosperity and extension of the Province to the Westward. Distances, topography, natural productions, geological structure and climatal conditions of these regions are carefully noted. Intending emigrants will find the work invaluable.

Geological Gossip, or Stray Chapters on Earth and Ocean. By Professor D. T. Ansted, M.A., F.R.S., &c. London: Routledge & Co. Montreal: B. Dawson & Son.

A delightful book, both scientific and popular. It may be read

by young persons and amateurs with great pleasure and profit. The name of the author is a guarantee for the accuracy of its facts and the thorough treatment of its topics.

Coins, Medals, and Seals, Ancient and Modern; illustrated and described, with a sketch of the history of coins and coinage, instruction for young collectors, tables of comparative rarity, price lists of English and American coins, medals, and tokens, &c. Edited by W. C. PRIME. New York: Harper & Brothers. Montreal: B. Dawson & Son.

Mr. Prime has done good service to the young numismatist in the preparation of this book. The engravings of coins and medals, with the descriptions of their devices and legends, appear to be from English sources, and with the exception of the American coins, medals, and tokens, have, if we mistake not, come from the hands of English engravers. It is too much the habit of Messrs. Harper to conceal the sources from which many of their works are derived, thus depriving the legitimate author of the credit which he merits. This practice cannot be too strongly reprobated by every lover of fair dealing and of sound literature. Notwithstanding this stricture we cannot withold our meed of praise for the excellent and practical way in which the editor has treated his valuable materials. No better book on this subject can be put into the hands of young persons. The historical matter and hints to young collectors will be found most useful. The book is beautifully printed, and with the exception noted reflects credit upon the publishers.

The Zoologist. No. 224, London, Van Voorst, has been received. It contains many interesting and original notices on the subjects to which its pages are devoted and is indispensable to the student of Natural History.

The Geologist. No. 37, Vol. 4, London, has also come to hand and contains excellent and highly interesting articles by Roberts, Salter & Salmon. Also, the continuation of a paper on the Fossil Flint implements by the editor, Mr. Mackie, with well executed illustrations. This Magazine happily combines the popular and the scientific elements.

The Canadian Journal. No. 31, for January, Toronto, has been received and contains original articles by Professors Chapman Croft and Hincks, and Messrs. Mcllwraith & Robb, together with

well selected scientific and literary notes. Under the careful editorship of Prof. Chapman, this sister journal of western Canada continues to maintain its high standard of scientific and literary excellence.

The Academy of Natural Sciences of Philadelphia has sent us pages 325 to 360 of their *Proceedings* which are chiefly taken up with descriptions of new species of North American serpents in the Smithsonian Institution by Kennicott; and contributions to American Lepidopterology by Clemens.

The Natural History Society of Boston has also sent us pages 385 to 416 of their *Proceedings*, in which we find some valuable geological notes by Prof. Rogers to which we hope to draw attention in a future number.

The Essex Institute has sent us its *Proceedings*, Vol. II, Part 2, 1857 to 1859, the chief interest of which is the record they contain of the Field Meetings of this Society. These meetings we have long admired, and consider them most effective and pleasing means of promoting the interests of Natural Science. The *Historical Collections* of the same Institute, Vol. 2, No. 6, have also been received, and contain much curious and ancient lore.

MISCELLANEOUS.

Botanical Society of Canada, abstract of Recent Discoveries in Botany and the Chemistry of Plants. By Professor Lawson.

SEA-WEED AS A MANURE.

The attention of the English farmer has been recently called to the use of sea-weed as a manure. This material is thrown up in enormous quantities on the shores of Britain, and on the east coast of Scotland it is extensively employed to fertilize sand dunes that would otherwise be worthless. In dry sandy soils it acts in two ways; first, by directly contributing food materials to the crop, and, secondly, by the hygroscopic action of the mucilaginous tissues in maintaining a certain degree of humidity in the arid soil, a result that is no doubt aided by the presence of the sea-salt accompanying the weed. The richness of the ash of the common sea-weed in potash, soda, phosphates, and other materials

of plant growth, shows that it has a high manurial value. In Greenland specimens, the ash has been found to contain ten per cent of phosphates. The proportion of water in the recent weed is so large, however, that sea-weed cannot be profitably carried to great distances, but along the shores of the lower St. Lawrence and in other maritime provinces, where it can be readily obtained at certain seasons, its value can scarcely be overrated. The processes that have been suggested for converting the sea-weed into a paste for transport, mixing with peat ashes, &c., do not seem likely to lead to any useful result, so far as the British American provinces are concerned.

PAPER MATERIALS.

The cry for "more rags" which paper-makers raised some years ago, necessary failed to increase the supply of rags, but it served to bring materials to the paper-mill that had not been previously thought of. Hollyhock stems and straw and heather, and a hundred other substances, were tried and found suitable in various degrees. Many of these, while capable of being converted into paper, could not be profitably used in the manufacture; but several have taken their place as really important sources of paper fibre. Plants that require to be cultivated exclusively for this purpose are not likely to yield satisfactory results, and of late years, therefore, attention has been especially directed to the waste products of agriculture. In all agricultural plants woody fibre is produced to a greater or less extent, and that of the straw of cereal grains has been used for a number of years to a considerable extent. The leaves and husks of Indian Corn (*Zea Maize*) are also coming into extensive use, as appears from interesting details published by Professor Lindley in the Gardeners' Chronicle. Dr. Lindley's account of the manufacture appears to be founded upon statements that have appeared in the *Breslauer Gewerbeblatt* and the Daily Telegraph, a London paper. The following extracts will be of interest on this side of the Atlantic, where Indian Corn is produced in such enormous quantities:—

"Recent experiments have proved Indian Corn to possess not only all the qualities necessary to make a good article, but to be in many respects superior to rags. The discovery to which we allude is a complete success, and may be expected to exercise the greatest influence upon the price of paper. Indian Corn, in countries of a certain degree of temperature, can be easily cultivated to a degree more than sufficient to satisfy the utmost demands of

the paper market. Besides, as rags are likely to fall in price, owing to the extensive supply resulting from this new element, the world of writers and readers would seem to have a brighter future before it than the boldest fancy would have imagined a short time ago. This is not the first time that paper has been manufactured from the blade of Indian Corn; but, strange to say, the art was lost, and required to be discovered anew. As early as the seventeenth century, an Indian corn paper manufactory was in full operation in the town of Rievi, in Italy, and enjoyed a world-wide reputation at the time; but with the death of its proprietor the secret seemed to have lapsed into oblivion. Attempts subsequently made to continue the manufacture were baffled by the difficulty of removing the flint and resinous and glutinous matter contained in the blade. The recovery of the process has at last been affected and is due to the cleverness of one Her Moritz Diamant, a Jewish writing-master in Austria, and a trial of his method on a grand scale, which was made at the Imperial manufactory at Schlogelmuhle, near Glognitz (Lower Austria), has completely demonstrated the certainty of the invention. Although the machinery, arranged as it was for the manufacture of rag-paper, could not of course fully answer the requirements of Her Diamant, the results of the essay were wonderfully favourable. The article produced was of a purity of texture and whiteness of colour that left nothing to be desired; and this is all the more valuable from the difficulty usually experienced in the removal of impurities from rags. The proprietor of the invention is Count Carl Octavio Zu Lippe Weissenfeld, and several experiments give the following results:—

'1. It is not only possible to produce every variety of paper frem the blades of Indian corn, but the product is equal and in some respects even superior, to the article manufactured from rags.

'2. The paper requires very little size to render it fit for writing purposes, as the pulp naturally contains a large proportion of that necessary ingredient, which can at the same time be easily eliminated if desirable.

'3. The bleaching is effected by an extraordinary rapid and facile process, and, indeed, for the common light-coloured packing paper the process becomes entirely unnecessary.

'4. The Indian corn paper possesses greater strength and tenacity than rag paper, without the drawback of brittleness so conspicuous in the common straw products.

'5. No machinery being required in the manufacture of this paper for the purpose of tearing up the raw material and reducing it to pulp, the expense, both in point of power and time, is far less than is necessary for the production of rag paper.

'Count Lippe having put himself in communication with the Austrian Government, an Imperial manufactory for Indian corn paper (*maishalm papier*, as the inventor calls it) is now in course of construction at Pesth, the capital of the greatest Indian corn growing country in Europe. Another manufactory is already in full operation in Switzerland; and preparations are being made on the coast of the Mediterranean for the production and exportation on a large scale of the pulp of this new material.'"

The ancient vegetation of North America.—The following general results are selected from an excellent article in Silliman, by Dr. J. S. Newberry:

1*st.* The flora of the Devonian and Carboniferous epochs in America, was, in all its general aspects similar to that of the Old World, which has been so fully described; most of the genera, and a larger number of species than at any subsequent period having been common to the two sides of the Atlantic. The relative number of identical species has, however, it seems to me, been somewhat overrated. In many of the species, regarded as the same in Europe and America, the American plants present prevalent or constant characters which may serve to distinguish them. These differences, though frequently remarked by writers, have not been thought to have a specific value; yet it it quite certain that they are as tangible and important as those which now separate many American and European species of recent plants and recent or fossil animals. I have a conviction that the progress of science will considerably diminish the proportion of identical species; a closer scrutiny and more extensive comparison of specimens resulting in the discovery of constant, though inconspicuous characters, which shall be ultimately conceded to be specific.

It is true, also, that in molluscous palæontology, recent geology, and botany the number of species common to the two continents has been considerably reduced of late years; a large number of American representatives of European species, at first considered identical for their striking and obvious coincidences, having, on closer study afforded constant though less conspicuous differences.

2*nd.* The Permian, Triassic and Jurassic rocks have hitherto furnished us but few species for comparison, but the material is increasing, and I have now on hand a large collection which has not yet been studied. Enough is already known to show that the great revolution which took place in Europe at the close of the Permian epoch was matched by a parallel though less sudden change in the flora of America.

Here as there the Lepidodendroid trees, the *Sigillariæ*, the *Nœggerathiæ*, the *Asterophyllitæ*, and the great variety of ferns that gave character to the Carboniferous vegetation were superseded by *Voltzia*, *Tœniopteris*, *Camptopteris* and a varied and beautiful Cycadaceous flora, in which were many species of *Zamites*, *Pterophyllum*, *Nilsonia*, *&c.*, the representatives of those of the "Age of Gymnosperms." which culminated in the Jurassic epoch of Europe.

During this great interval the generic correspondence between the floras of Europe and America was perhaps as plainly marked as during the Carboniferous age, but the relative number of identical species was apparently smaller.

3*d.* At the commencement of the Cretaceous epoch the flora of the continent was again revolutionized, and the vegetation of its temperate portions given the general spect that it now presents.

This statement will surprise many, for the flora generally ascribed to the Chalk period is greatly different from that of the present. Unger has thus represented it, and Brongniart calls it a transition from the great Cycadaceous flora of the Jurassic period to the Angiospermous flora of the Tertiary. In Europe the Cretaceous flora was apparently more like that of the Lias and Oolite than in this country, for while the genera *Salix*, *Acer*, *Populus Alnus*, *Quercus*, *&c.*, were then introduced there as here, its general aspect was modified by the presence of numbers of *Cycadaceæ*, and its sub-tropical character attested by fan-palms.

We may find hereafter in other parts of the continent than those in which I have examined the Cretaceous strata, fossils which shall assimilate our flora of that period more closely to that of Europe; but as far as at present known, our plants of this age present an *ensemble* quite different. I have now some sixty or seventy species of Cretaceous plants, collected in New Jersey and in various parts of the great Cretaceous area of the interior of the continent, all of which indicate a flora very similar to that now

occupying the same region; many, perhaps most, of the genera being now represented in our forests—such as *Liriodendron Platanus, Acer, Populus, Salix, Alnus, Fagus, &c.* These specimens have been collected in localities included between the 36th and 41st paralles of latitude, but range from the 74th to the 110th longitude. Nowhere within this area have I yet detected any traces of palms or any indications of a tropical climate. At the base of the Yellow Sandstone series of New Mexico (Lower Cretaceous) I have found a varied and interesting flora, containing *Pterophyllum, Nilsonia, Camptopteris, &c.*, with a few Angiosperm dicotyledonous leaves. This is evidently the point of junction between the Cycadaceous flora of the Jurassic age and that of the chalk; for in the entire overlying Cretaceous strata, 4000 feet in thickness, though Angiospermous leaves are abundant those of Gymnospermous plants were no where discovered, nor any traces of palms, either leaves or stems. The sandstones of the Cretaceous series contain immense numbers of silicified trunks, but they are for the most part coniferous.

4th. For the glimpses have I obtained of the tertiary flora of North America I am mainly indebted to the kindness of Dr. Hayden who has spent several years in most successfully exploring the geology, botany, and zoology of the country bordering the Upper Missouri. Among his rich collections are fifty or more species of beautifully preserved fossil plants from the Miocene, which have been put into my hands for examination, and of which descriptions will be published, immediately after my return to Washington.

Not having the specimens, or my notes on them, with me, I can speak only generally of the flora they represent. I remember, however, that they include species of *Platanus*,—one of which closely resembles Unger's great *P. Hercules*, and is perhaps as large; *Populus, Acer, Castanea, Sapindus, Carpinus, Ulmus Diospyros, Quercus, Salix, Taxodium*, and others which indicate a flora in all its general aspects similar to that now occupying the Valley of the Mississippi. A few plants in the collection would seem to have required a somewhat warmer climate than that which the localities where they are found enjoy at present; but there are no palms amongst them, nor any of the tropical genera *Cinamonium, Sterculia, Dombeyopsis, &c.* so common in the Tertiary strata of Europe.

In the enumeration of the Miocene plants of the Pacific coast given by Mr. Lesquereux I find also evidence of a marked and in-

teresting difference of temperature during the Tertiary epoch, in different parts of the North American continent, under the same parallels of latitude. Mr. Lesquereux finds in Dr. Evans's collection of palms, *Salisburia, Cinamonium, &c.*, which indicate at least a sub-tropical climate; a flora quite unlike that from the Miocene of the Upper Missouri, although as he remarks, similar to that of the Miocene of Europe.

I am tempted to dwell for a moment no the interesting glimpses of the physical geography of our continent in geological times which these facts and others that have come under my observation afford.

1*st.* A large continental area occupied the place of the interior of North America, from the earliest Palæozoic ages.

2*d.* During the Carboniferous epoch, this land sustained a vegetation similar to that of the Coal period of Europe and Eastern America, though far less varied.

3*d.* Through theTriassic and Jurassic ages, the sediments from the land were strikingly like, in mineral character, to those of the same age in the Old World: and the flora was characterised by a preponderance of Cycadaceous plants, analogous of those of the Jurassic of Europe.

4*th.* In the Cretaceous age, the central nucleus of the continent was sufficiently extensive to furnish from its ruins arenaceous sediments that now cover more than half a million square miles. These sediments contain vast deposits of carbonaceous matter mainly derived from the land plants which covered the continent. As far south as lat. 35° these plants were for the most part Coniferous or Angiospermous, and included many genera now characteristic of temperate climates.

Through the Tertiary epoch, our continent had nearly the form and area it now has, the Tertiary deposits merely skirting its borders. The Marine Tertiaries are nearly limited to the shores of the present oceans, while the patches of strata of that age found nearer the centre of the continent are all, so far as I have observed or heard, of fresh water or estuary origin. Between the western base of the Sierra Nevada and the Mississippi there are, I believe no Tertiary beds not of this character, and the larger part of the great central plateau has never been covered with Tertiary or Drift sedim. ts, but has, since the close of the Cretaceous epoch, been as now, dry land.

The facts which I have enumerated seem to indicate that over this ancient land the isothermal lines were curved much as now, and that during the Tertiary ages, there was perhaps as great a difference between the climate of the Pacific and Atlantic watersheds as exists at present.

Flint Implements in the Drift.—Very exciting dissensions have lately taken place among geologists in Europe, on the discovery in several places of the remains of man and his works mingled with those of extinct animals of the later tertiary period. The question is still *sub judice*, as it appears not yet certainly ascertained in most of the cases what are the age of the deposits, or whether they have not been disturbed by land floods, or by human agency. The most probable conclusion of the investigation thus far is, that the deposits containing these remains belong to a time later than the last great elevation of the land, and are the results of local debacles in river valleys, either occurring at a time when man had begun to colonize the regions in question, and certain tertiary animals were not yet wholly extinct, or in which human remains and works of art were caught up and mixed with fossils previously existing under the soil. With respect to the first of these alternatives it may be observed, that there is no improbability in the supposition that many animals of the latest tertiary period, remained until the introduction of man and perished subsequently, since we know that some animals thus ancient, as for instance, our American Musk Ox, still survive. The subject is a very interesting one and may lead to important conclusions respecting the commencement of the human period. We quote from the *Geological Journal*, a short paper by Mr. Flower, which gives a good idea of the nature of the facts as they relate to the district near Amiens which has been one of the principal seats of these discoveries.

"The implement or weapon, the subject of these observations, was found by me about a month since, when in company with Mr Prestwich and other Fellows of this Society I visited some gravel-pits near Amiens. When discovered it was imbedded in a compact mass of gravel, composed of large chalk-flints much water worn and rolled, and small chalk-pebbles. It was found lying at the depth of sixteen feet from the upper surface, and about eighteen inches from the face or outer surface of the quarry to which extent the gravel had been removed by me before I found it. The bed of gravel now in question forms the capping

or summit of a slight elevation of the chalk. A section of this pit, which Mr. Prestwich lately exhibited to the Royal Society showed that the gravel presents here a thickness of about ten feet. Above this occurs a thin bed of coarse, white, silicious sand interspersed with small rounded chalk-pebbles; and above the sand is a layer of strong loam, of a red colour, which is now extensively worked for the purpose of making bricks. The remains of the elephant horse, and deer have been occasionally found in the gravel; and we found in the sand which rests upon it an abundance of land and freshwater shells, all of recent species. No fossils of any kind were discovered by us in the brick-earth lying on the surface. At the distance of a few hundred yards from the convent of St. Acheul are the remains of an ancient Roman cemetery. A large stone tomb is here left standing on the surface, the brick-earth having been cleared away from it; and here many Roman coins and bronze ornaments are found.

At St. Roch, (about half a mile distant from St. Acheul), we also examined a quarry of flint-gravel, of precisely the same character, and apparently of the same period, as that of St. Achuel. We procured from it two very fine tusks of the *hippopotamus*, which had been found twenty feet from the surface. These were but little rolled or broken, and it seems probable therefore, that the forces that transported these flint implements to their present position may also have deposited these remains of the *hippopotamus*.

The first discovery of these flint instruments, as well in this quarry as in other localities in the Valley of the Somme, is due to M. Boucher de Perthes, of Amiens. It was with a view to verify by personal observation the result of his researches that our visit to St. Acheul and the neighbourhood was undertaken. Mr. Prestwich had, indeed, previously visited the spot, and had embodied the result of his researches in a paper which was read before the Royal Society in May last. He had not, however, succeeded in finding one of these implements *in situ*, although he had procured several of them from the labourers. It was only after labouring for several hours that I succeeded in disinterring the specimen in question.

The result of our examination perfectly satisfied us, as it had already satisfied Mr. Prestwich, of the frequent occurence of these weapons or implements beneath the beds of loam, sand, and gravel which I have described. We not only found two good spe-

cimens of these implements, but we brought away upwards of thirty others, taken from the same pit. Some of these were found at about the same depth as that which I discovered, and some about four feet lower down. They were procured without difficulty from the labourers and their children. Mr. Prestwich, on the occasion of his first visit, in company with Mr. Evans, brought away about twenty specimens; and many others are to be seen in M. Boucher de Perthes' museum. They are so common in the pit in question as to have acquired a trivial name and are known by the workpeople as *langues de chat.*

There is one peculiarity of these implements which appears to deserve particular notice; they were evidently water-worn and rounded pebbles before they were formed into weapons, or tools; and this, indeed is just such a condition as we should expect to find. None but people destitute of iron would have been content to use such rude and uncouth instruments as these; and a people unprovided with iron would also be unable to quarry the chalk for the sake of the flint imbedded in it, but would have been forced to content themselves with those fragments which lay scattered upon the surface, or but a little below it. If we examine the specimens closely, we find that, while the manufactured or worked surfaces, (namely the cutting edges and the point) are nearly as sharp and clear as if worked yesterday, the portion left of the original, or, if we may so call it, the *natural* surface (that which has not been struck off in the course of the manufacture), is often very much water-worn; and it also presents that peculiar discoloration, usually found in flints long exposed to the influence of the atmosphere, extending to the depth of a quarter or an eighth of an inch, and probably due to some chemical change resulting from mechanical forces.

It would thus seem that these forces, whatever they may have been, by means of which these implements were carried into their present position, were in operation but for a short period, since otherwise the sharp edges which they still retain would have been rounded and worn if not altogether obliterated; and further that the rolled and discoloured surface of the flint-pebbles with which they are associated (and from which indeed, it seems probable that they were originally taken and fashioned) was due to some former change—the drift or gravel having subsequently been merely shifted from some other spot, bearing these

implements with it, just as the loose ballast in the hold of a vessel is shifted and rolled from one side to another.

No one who attentively examines these implements can doubt hat they are the products of human skill. Rude and uncouth as they may appear, that rudeness is probably not so much due to any deficiency of intelligence in the manufacturer as to the want of iron or some other metals wherewith to work. Probably no workman who found himself destitute of metal would be able to produce from flint-pebbles more useful or elegant implements. Those who are familiar with the forms which are presented in those flints which are casually fractured, will agree that it is almost impossible that even a single flint should be so fractured by accident as to assume the shape of these implements ; but here we have a great number, all taken from a single quarry. Further, it will be seen that the original or natural surface is never retained where t at all interferes with the shape and symmetry of the weapon. Whenever it would have so interfered, chiefly on the sides and at the point, it has been chipped away ; and thus there has been no waste of labour, nothing having been removed but that which was inconvenient. It will also be noticed that they are all formed after a certain rude but uniform pattern ; they are worked to a blunt point, at one end, with a rude cutting edge on each side, and a sort of boss at the other extremity, forming a handle or hand-hold. In order the better to form this double edge, a ridge s left running down the centre ; and the edges have been formed by striking away the flint in splinters from each side, in a direction at right angles with, or a little oblique to, the axis, the base or under side being usually either flat, or but slightly convex.

The discovery of these implements under the circumstances indicated cannot fail to suggest many interesting inquiries. We should all desire to know something more concerning the persons by whom, and the purposes for which, they were fabricated,—how it happened that so many of them were brought together in so small a space, and how it is that no remains have hitherto been found of those by whom they were made and used. These, however are speculations which seem to belong to the province of archæology rather than to that of geology ; and they are only now alluded to by way of suggestion that topics of such importance and interest are well deserving of the investigation of archæologists."—*Quarterly Journal of the Geological Society.*

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

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

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

Day of Month.	Barometer—corrected and reduced to 32° F. (English inches.)			Temperature of the Air.—F.			Tension of Aqueous Vapour.			Humidity of the Atmosphere.			Direction of Wind.			Horizontal Movement in 24 hours. In miles.	OZONE.	RAIN.	SNOW.	WEATHER, CLOUDS, REMARKS, &c. &c. [A cloudy sky is represented by 10, a cloudless one by 0.]		
	6 a. m.	2 p. m.	10 p. m.	6 a. m.	2 p. m.	10 p. m.	6 a. m.	2 p. m.	10 p. m.	6 a. m.	2 p. m.	10 p. m.	6 a. m.	2 p. m.	10 p. m.		Mean amount of, in tenths.	Amount of, in inches.	Amount of, in inches.	6 a. m.	2 p. m.	10 p. m.
1	29.914	29.873	29.174	30.1	31.7	26.0	.143	.149	.115	.89	.84	.87	W. N. W.	W. S. W.	W. S. W.	299.04	4.0	.....	1.10	Cu. Str. 10.	Snow.	Snow.
2	202	259	425	24.2	23.2	27.3	.111	.135	.127	.86	.85	.87	W.	W. by S.	W. by S.	299.30	3.0	.....	1.58	" 10.	Cu. Str. 10.	Cu. Str. 10.
3	552	741	756	26.1	32.1	30.0	.123	.143	.155	.87	.79	.92	W. by S.	S. by W.	W.	248.00	3.5	.....	.....	" 8.	" 4.	" 10.
4	817	704	736	29.1	28.2	25.5	.115	.129	.117	.83	.82	.87	N. E. by E.	N. E. by E.	N. E. by E.	106.44	3.0	.....	.....	" 10.	C. C. Str. 4.	" 10.
5	579	493	582	23.0	27.2	21.3	.106	.111	.090	.86	.75	.78	N. W. by N.	S.	W. by N.	287.30	3.5	.....	.....	" 10.	Cu. Str. 10.	" 10.
6	553	572	674	14.1	21.5	13.8	.067	.090	.093	.81	.75	.82	W. by N.	E. S. E.	S. E. by E.	59.30	4.0	.....	.....	C. C. Str. 6.	" 10.	Clear.
7	745	819	714	18.2	20.2	12.3	.082	.075	.060	.84	.70	.80	N. E. by E.	N. E. by E.	S. by E.	45.40	2.5	.....	Inapp.	Cu. St. 10.	C. C. Str. 4.	Cu. Str. 10.
8	472	30.030	934	14.0	34.2	13.9	.067	.094	.059	.81	.73	.75	N. E. by E.	S. S. W.	S. E.	35.30	2.5	.....	.....	" 10.	Cu. St. 4.	Clear. Zodiacal light.
9	30.076	29.800	30.137	15.4	30.0	17.4	.070	.126	.072	.82	.81	.76	S. S. W.	W. S. W.	W. S. W.	42.90	2.0	.....	.....	C. C. Str. 4.	" 2.	Au. B. and Zod. lt.
10	29.918	594	29.400	8.8	17.5	21.1	.060	.078	.035	.86	.83	.78	N. E. by E.	N. by W.	N. E. by E.	243.50	3.5	.....	3.31	Snow.	Snow.	Snow.
11	562	679	782	20.1	15.5	8.8	.091	.061	.042	.85	.78	.73	N. N. W.	W. N. W.	W. N. W.	228.31	2.5	.....	0.27	"	Cu. Str. 10.	Clear.
12	514	302	476	10.4	14.6	11.6	.054	.061	.051	.78	.73	.70	S. S. W.	W. S. W.	E. S. E.	97.20	2.5	.....	0.75	Cu. Str. 10.	Snow.	Cu. Str. 4.
13	373	635	889	9.4	9.0	1.0	.051	.042	.034	.78	.76	.80	W. S. W.	W.	W. S. W.	66.70	2.0	.....	.....	C. C. Str. 4.	C. C. Str. 2.	Clear.
14	30.203	30.346	30.510	10.0	0.0	7.5	.016	.030	.325	.60	.69	.80	W.	W.	W.	0.10	2.5	.....	.....	Clear.	Clear.	"
15	451	411	392	— 8.1	6.0	— 3.0	.020	.035	.052	.60	.61	.80	N. E. by E.	N. E. by E.	S. W. by S.	17.30	2.0	.....	.....	Cu. Str. 10.	"	Cu. St. 10.
16	097	29.969	056	—11.8	13.0	16.2	.020	.054	.074	.76	.71	.83	N. E. by E.	S. S. W.	S. W. by S.	25.80	2.0	.....	.....	C. C. Str. 2.	C. Cum. 2.	" 10.
17	259	30.265	378	6.2	9.5	2.3	.047	.060	.040	.86	.76	.85	W.	S. S. W.	S. W.	172.50	2.0	.....	.....	C. Str. 8.	Clear.	C. C. Str. 2. Zodiacal light.
18	507	545	649	— 6.0	3.0	— 8.9	.028	.028	.024	.81	.68	.79	N. E. by E.	N. E. b y E.	N. E. by E.	88.60	2.0	.....	.....	Clear.	"	Clear. Zodiacal light.
19	389	209	296	— 9.0	4.0	20.1	.023	.038	.091	.77	.78	.85	N. E. by E.	N. E. by E.	E. by S.	169.10	3.0	.....	.....	C. C. Str. 10.	Snow.	Cu. Str. 10.
20	204	109	132	32.4	34.0	19.0	.175	.183	.142	.94	.90	.88	E. by S.	N. E. by E.	N. E. by E.	214.20	5.0	0.714	2.18	Rain.	"	Nimb. 10.
21	29.594	29.551	29.645	26.1	22.3	12.9	.123	.084	.054	.87	.71	.71	W. S. W.	W. S. W.	W.	140.51	3.0	.....	4.40	C. C. Str. 10.	Cu. Str. 10.	Clear.
22	483	802	845	19.0	31.2	19.1	.087	.149	.087	.84	.84	.84	N. E. by E.	N. E. by E.	W. by S.	113.10	4.8	.....	3.20	Cu. Str. 10.	Snow.	Cu. Str. 10.
23	996	30.029	30.104	6.0	19.7	7.2	.043	.081	.045	.73	.77	.76	S. W.	W. S. W.	W. S. W.	88.90	2.0	.....	.....	Snow.	Clear.	Clear.
24	30.116	048	178	2.0	17.2	11.6	.034	.063	.057	.71	.67	.79	W. S. W.	W.	W.	248.40	2.0	.....	.....	Clear.	"	Cirr. Str. 4. Lunar Halo.
25	154	033	089	9.2	19.8	18.1	.051	.081	.088	.77	.78	.92	W.	S. S. W.	S. W.	243.60	2.5	.....	Inapp.	Cu. Str. 4.	C. C. Str. 10.	Cu. Str. 10.
26	253	248	242	14.2	29.9	23.9	.067	.123	.100	.81	.77	.79	S. W.	S. W.	W. S. W.	34.50	2.5	.....	Inapp.	C. C. Str. 10.	Snow.	" 10.
27	317	301	424	19.1	25.4	17.8	.087	.111	.072	.84	.81	.75	W. S. W.	W. S. W.	W. S. W.	7.60	2.0	.....	.....	" 10.	"	" 10.
28	468	415	503	17.3	28.4	18.9	.074	.129	.077	.77	.82	.76	W. S. W.	W. S. W.	S. by W.	5.80	2.0	.....	.....	" 10.	Cu. Str. 10.	Hazy.
29	510	342	328	16.1	19.3	16.8	.074	.071	.070	.83	.69	.80	N. E. by E.	N. E. by E.	N. E. by E.	60.40	2.5	.....	.....	" 10.	" 10.	Clear. Zodiacal light.
30	323	272	220	17.0	31.2	31.4	.078	.155	.185	.83	.89	.89	N. E. by E.	S. E. by E.	S. E. E.	102.09	4.5	.....	4.80	Snow.	Snow.	Cu. Str. 10.
31	259	240	268	19.1	24.1	20.9	.082	.100	.088	.84	.79	.78	W. S. W.	W. S. W.	S. W.	257.50	4.5	.....	.....	Cu. Str. 10.	Cir. Cul, 4.	" 10.

REPORT FOR THE MONTH OF JANUARY, 1861.

Day of Month.	Barometer—corrected and reduced to 32° F. (English inches.)			Temperature of the Air.—F.			Tension of Aqueous Vapour.			Humidity of the Atmosphere.			Direction of Wind.			Horizontal Movement in 24 hours. In miles.	OZONE.	RAIN.	SNOW.	WEATHER, CLOUDS, REMARKS, &c. &c. [A cloudy sky is represented by 10, a cloudless one by 0.]		
	6 a. m.	2 p. m.	10 p. m.	6 a. m.	2 p. m.	10 p. m.	6 a. m.	2 p. m.	10 p. m.	6 a.m.	2 p. m.	10 p. m.	6 a. m.	2 p. m.	10 p. m.		Mean amount of	Amount of, in inches.	Amount of, in inches.	6 a. m.	2. p. m.	10 p. m.
1	30.071	29.981	30.058	21.4	28.0	19.8	.096	.117	.081	.85	.76	.77	S. W.	W. S. W.	N. by E.	168.30	5.0	.....	0.70	Snow.	Cu. Str. 6.	Fog.
2	29.850	901	063	19.4	31.8	13.8	.097	.149	.057	.92	.84	.72	S. W.	N. W.	N. E.	228.90	4.0	.....	.....	Cu. Str. 10.	Str. 10.	Cu. Str. 10.
3	0.151	30.087	29.913	1.9	7.3	7.3	.036	.040	.045	.84	.67	.76	N. E. by E.	N. E. by E.	N. N. E.	286.20	3.0	.....	0.50	" 10.	Cu. Str. 10.	" 10.
4	009	29.954	30.009	8.4	16.1	2.5	.064	.061	.042	.88	.73	.86	W. S. W.	W. S. W.	W. S. W.	97.20	3.5	.....	.....	" 10.	Clear.	Clear. Zod. light, aurora borealis
5	29.985	30.027	024	10.5	26.0	22.7	.059	.111	.095	.89	.81	.79	S. by W.	W. S. W.	W. by S.	184.40	2.0	.....	.....	" 10.	Cu. Str. 10.	Cu. Str. 10.
6	30.299	147	075	11.0	10.6	7.3	.062	.059	.045	.89	.89	.89	W.	W. N. W.	W. N. W.	136.50	5.0	.....	0.57	C. C. Str. 9.	" 10.	" 10.
7	29.878	29.305	29.898	4.6	10.6	7.4	.046	.048	.051	.87	.69	.87	N. E. by E.	N. E. by E.	N. E. by E.	446.50	3.0	0.100	1.10	Cu. Str. 10.	Snow.	Rain and Sleet.
8	30.066	30.076	30.065	5.0	24.1	20.0	.041	.094	.081	.74	.73	.77	N.	W. S. W.	W. S. W.	199.60	3.5	.....	.....	" 10.	C. C. Str. 4.	C. C. Str. 4.
9	055	29.928	29.855	— 5.0	4.0	1.5	.029	.030	.031	.81	.59	.70	N. by W.	N. E. by E.	N. E. by E.	82.90	5.0	.....	.....	" 10.	Cu. Str. 2.	Cu. Str. 10.
10	29.540	337	552	2.7	13.0	5.0	.040	.077	.032	.84	.76	.14	N. by E.	W.	W.	239.20	3.5	.....	0.75	" 10.	Snow.	Clear. Zod. light, aurora borealis.
11	980	978	30.075	23.0	—10.6	—20.6	.004	.015	.032	.25	.55	.33	W.	W. S. W.	S. W. by S.	245.50	3.0	.....	.....	Clear.	Clear.	" " "
12	30.096	30.191	204	35.7	— 5.1	—17.9	.002	.026	.006	.22	.70	.40	W.	S. S. W.	S. S. W.	27.20	2.0	.....	.....	"	"	" " "
13	473	563	555	26.6	1.6	—16.9	.008	.026	.008	.37	.56	.71	S. E. by E.	S. W. by S.	S. S. E.	17.20	2.0	.....	.....	"	"	" " "
14	337	245	030	13.8	6.4	3.0	.018	.049	.015	.74	.87	.72	N. E. by E.	S.	N. E. by E.	74.70	3.0	.....	.....	Cu. Str. 10.	Cu. Str. 4.	Cu. Str. 10.
15	077	29.940	040	7.0	21.7	20.0	.045	.090	.036	.76	.78	.84	N. E. by E.	N. E. by E.	N. by E.	169.90	5.0	.....	.....	" 10.	" 10.	" S.
16	29.891	614	29.552	22.3	24.2	14.3	.101	.085	.082	.86	.79	.87	N. E. by E.	N. by E.	N. E. by E.	363.90	5.5	.....	5.46	" 10.	Snow.	Snow.
17	759	959	29.197	16.0	17.0	5.0	.074	.078	.078	.83	.83	.74	N. E. by E.	N. E. by E.	N. E. by E.	164.70	5.5	.....	.....	" 10.	Clear.	Clear. Zodiacal Light.
18	30.130	30.080	29.750	— 2.0	6.8	8.7	.030	.043	.041	.80	.75	.79	N. E. by E.	N. by E.	N. E. by E.	139.20	4.0	.....	.....	Clear.	Cu. Str. 10.	Cu. Str. 10.
19	29.600	29.550	728	12.2	18.9	15.3	.063	.077	.052	.81	.76	.82	N. E. by E.	N. E. by E.	N. E. by E.	998.10	5.5	.....	11.15	Snow.	Snow.	Snow.
20	680	674	816	13.1	19.9	10.0	.063	.077	.070	.81	.76	.68	W. S. W.	W. N. W.	W. S. W.	103.20	5.0	.....	.....	Clear.	Clear.	Cu. Str. 10.
21	900	938	30.084	5.1	14.7	11.1	.041	.061	.045	.74	.73	.79	W. by S.	W.	W.	372.80	2.5	.....	.....	Cu. Str. 4.	Cu. Str. 10.	" 10.
22	30.317	30.359	526	4.3	17.4	5.0	.036	.072	.057	.73	.76	.73	W.	W. S. W.	W. S. W.	574.40	2.0	.....	.....	C. C. Str. 6.	Clear.	Clear.
23	620	626	687	—16.1	9.6	— 4.6	.009	.045	.038	.43	.68	.82	W. by S.	S. by W.	S.	111.90	2.0	.....	.....	Clear.	"	"
24	416	160	29.873	— 8.4	6.3	24.1	.056	.040	.029	.79	.70	.86	N. E. by E.	N. E. by E.	S. E. by E.	65.40	4.5	.....	6.40	Cu. Str. 4.	Snow.	Snow.
25	29.650	29.880	912	21.4	22.1	20.1	.085	.084	.111	.78	.71	.72	W. S. W.	S. W.	W. S. W.	90.60	5.5	.....	2.15	Clear.	C. C. Str. 8.	Cu. Str. 10.
26	30.080	30.050	30.167	19.0	29.8	20.4	.087	.142	.074	.84	.88	.85	S. S. W.	S. W.	S. by E.	92.10	5.0	.....	.....	Cu. Str. 4.	Cu. Str. 10.	" 10.
27	29.999	29.920	29.810	16.0	30.6	24.6	.074	.130	.091	.83	.78	.80	S. E. by E.	W. by S.	W. by S.	7.10	0.0	.....	.....	" 10.	" 10.	" 10.
28	760	840	671	22.1	26.2	19.1	.090	.105	.105	.78	.73	.84	S. S. E.	W. S. W.	W. S. W.	103.10	5.0	.....	1.00	" 4.	Snow.	Snow.
29	510	517	761	21.1	23.1	19.0	.036	.084	.087	.84	.71	.84	W. S. W.	W. S. W.	S. W.	379.40	2.5	.....	1.10	Cu. Str. 10.	Cu. Str. 10.	Cu. Str. 10.
30	857	872	879	8.7	16.8	18.4	.042	.068	.082	.86	.75	.82	W.	W. S. W.	W. S. W.	346.40	2.0	.....	.....	C. C. Str. 8.	" 10.	" 10.
31	884	920	930	14.7	21.0	18.1	.061	.080	.052	.75	.71	.84	W. S. W.	W. S. W.	W. S. W.	69.50	2.0	.....	.....	Cu. Str. 10.	" 10.	" 4.

REMARKS FOR DECEMBER, 1860.

Barometer..... Highest, the 18th day, 30·649 inches. Lowest, the 1st day, 29.173 " Monthly Mean, 29.918 " Range, 1.476 "

Thermometer... Highest, the 20th day, 34°0. Lowest, the 14th day, 13°0. Monthly Mean, 18°18. Monthly Range, 47°0.

Greatest intensity of the Sun's rays, 51°7.1
Lowest point of Terrestrial radiation,—14°1.
Mean of Humidity, .786.

Rain fell on 1 day, amounting to 0.714 of an inch; it was raining 14 hours and 10 minutes.
Snow fell on 12 days, amounting to 21·56 inches; it was snowing 84 hours and 54 minutes.
Most prevalent wind, the W.
Least prevalent wind, the S.
Aurora Borealis visible on 1 night.
Lunar Halo visible on 1 night.
Zodiacal Light bright.
The Electrical state of the Atmosphere has indicated moderate intensity.

REMARKS FOR JANUARY, 1861.

Barometer. ..... Highest, the 23rd day, 30.637 inches. Lowest, the 10th day, 29.357 " Monthly Mean, 29.983 " Monthly Range, 1·350 "

Thermometer. Highest, the 2nd day, 31°8. Lowest, the 12th day,—34°7. Monthly Mean, 10°43. Monthly Range, 66°5.

Greatest intensity of the Sun's rays, 33°4.
Lowest point of terrestrial radiation, 36°0.
Mean of humidity, .752.

Rain fell on 1 day, amounting to 0.100 of an inch; it was raining 4 hours 10 minutes.
Snow fell on 11 days, amounting to 31.88 inches, it was snowing 69 hours and 30 minutes.
Most prevalent wind, the N. by E.
Least prevalent wind, the N.
Most windy day, the 19th day; mean miles per hour, 42.08.
Least windy day, the 27th day; mean miles per hour, 0.29.
Zodiacal light very bright, and well defined.
Aurora Borealis visible on 2 nights.
The Electrical state of the Atmosphere has indicated constant and moderate intensity.

CONTENTS OF NUMBER I.

SMITH, BECK & BECK'S

NEW

Achromatic Stereoscope.

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Do. Mahogany do., - - - - - - - - - - - - $21.00

Stereoscopic Phototographs of the Moon on Glass, from negatives taken by Warren De la Rue, Esq., F. R. S., - - - - - - - - $6.50

Extract from the "Athenæum," Aug. 28, 1858, page 269.

"The adoption by Mr. CHAPPUIS of the principle of the daylight reflector to the stereoscope was noticed by us in the *Athenæum* for Nov. 7th, 1857. We there made some suggestions for further improvements, with a recommendation to Mr. CHAPPUIS to 'try them.' That gentleman has not done so; but Messrs. SMITH & BECK have not only carried out, they have gone beyond our suggestions,—and from a toy the stereoscope has progressed to an object belonging to science. A few words will enable our readers to understand the improvements that have been made in this justly popular instrument. 1st. By the introduction of achromatic lenses the optical part is greatly improved, thereby increasing the definition and correcting the colour which single lenses invariably show on the margin of the objects. These errors in the unachromatic stereoscope frequently destroy the delicacy of the image altogether.—2nd. By the application of lenses of such a focal length, and placed at such a distance apart as that all shall see without fatigue, which is not the case with those hitherto contrived. But with these improvements in the optical part of the instrument arose the need of greater delicacy in the mechanical contrivances for observing to the best advantage; this led—3rd. To an arrangement whereby any one having the sight of both eyes could see the effect.—4th. A thoroughly steady and substantial stand adapted for a person seated at a table, and allowing of any alteration of position. 5th. A method for holding the slides so that they can be placed and replaced easily and without danger.—6th. Means have been adopted for varying the illumination at pleasure, causing a great variety of very beautiful effects of light and shade, from the cool tints of moonlight to the ruddy glow of the morning sun. And, lastly, a compact case to keep the whole from dust, injury, or exposure. The result is a perfection beyond which it is hardly possible to carry the stereoscope. This perfection is admirably exhibited in the stereoscopic views of the Moon, taken on glass by Mr. HOWLETT, from the negatives obtained by Mr. WARREN DE LA RUE with his equatoreal reflecting telescope of 13 inches aperture and 10 feet focal length. The stereoscopic effect is obtained by combining two views of the moon, taken at different epochs nearly in the same phase, but when the disc is in two different conditions of libration."

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