Technical and Bibliographic Notes / Notes techniques et bibliographiques

The Institute has attempted to obtain the best original copy available for filming. Features of this copy which may be bibliographically unique, which may alter any of the images in the reproduction, or which may significantly change the usual method of filming are checked below.

- [ ] Coloured covers/ Couverture de couleur
- [ ] Covers damaged/ Couverture endommagée
- [ ] Covers restored and/or laminated/ Couverture restaurée et/ou pelliculée
- [ ] Cover title missing/ Le titre de couverture manque
- [ ] Coloured maps/ Cartes géographiques en couleur
- [ ] Coloured ink (i.e. other than blue or black)/ Encre de couleur (i.e. autre que bleue ou noire)
- [ ] Coloured plates and/or illustrations/ Planches et/ou illustrations en couleur
- [x] Bound with other material/ Relié avec d'autres documents
- [x] Tight binding may cause shadows or distortion along interior margin/ La reliure serrée peut causer de l'ombre ou de la distorsion le long de la marge intérieure
- [ ] Blank leaves added during restoration may appear within the text. Whenever possible, these have been omitted from filming/ Il se peut que certaines pages blanches ajoutées lors d'une restauration apparaissent dans le texte, mais, lorsque cela était possible, ces pages n'ont pas été filmées.

L'Institut a microfilmé le meilleur exemplaire qu'il lui a été possible de se procurer. Les détails de cet exemplaire qui sont peut être uniques du point de vue bibliographique, qui peuvent modifier une image reproduite, ou qui peuvent exiger une modification dans la méthode normale de filmage sont indiqués ci-dessous.

- [ ] Coloured pages/ Pages de couleur
- [ ] Pages damaged/ Pages endommagées
- [ ] Pages restored and/or laminated/ Pages restaurées et/ou pelliculées
- [x] Pages discoloured, stained or foxed/ Pages décolorées, tachetées ou piquées
- [ ] Pages detached/ Pages détachées
- [x] Showthrough/ Transparence
- [x] Quality of print varies/ Qualité inégale de l'impression
- [x] Continuous pagination/ Pagination continue
- [ ] Includes index(es)/ Comprend un (des) index

Title on header taken from:/ Le titre de l'en-tête provient:

- [ ] Title page of issue/ Page de titre de la livraison
- [ ] Caption of issue/ Titre de départ de la livraison
- [ ] Masthead/ Générique (périodiques) de la livraison

- [ ] Additional comments:/ Commentaires supplémentaires:

This item is filmed at the reduction ratio checked below/
Ce document est filmé au taux de réduction indiqué ci-dessous.

10X 12X 14X 16X 18X 20X 22X 24X 26X 28X ✓ 30X 32X

The Canadian Journal.

TORONTO, MARCH, 1853.

"On the Land-birds wintering in the neighbourhood of Toronto."

BY G. W. ALLAN, ESQ.

(Read before the Canadian Institute, February 26th, 1853.)

It is not, I believe, an uncommon idea, even among those who have in some degree interested themselves in observing the movements and habits of our different birds, that when once the frosts and snows of winter have fairly set in, our woods are almost completely deserted by their feathered denizens.

It would probably, therefore, be a matter of surprise to many to learn that there are at least twenty different species of land birds, which remain with us through the whole of our long winter, braving the severest cold, and apparently finding abundant provision for the supply of their various wants.

I shall endeavour in this paper to give a few brief, though I fear very imperfect, notices of some of these different species, as they have fallen under my own observation at various times during the course of my rambles about the woods and fields in the immediate neighbourhood of Toronto. Some of the birds I shall mention are winter visitors only; others again remain with us throughout the whole year.

To begin with the birds of prey; the first I shall notice: the Bald-headed Eagle, although very rare, *has been* seen in this neighbourhood. On the shores of the Lake, near the Scarborough Heights, and about the Humber Bay, a solitary bird may still occasionally be met with. I saw one about three weeks ago, for the first time for many years flying down the valley of the Don towards Ashbridge's Bay: its white head, and the broad white patch near the tail, as well as its great size, render it easily distinguishable; and even at some little distance it may readily be recognized by its peculiar flight, which, when making for a *particular point*, is remarkably direct; never circling or sailing, but supported by long continuous equal strokes of the wings, without intermission, as long as the bird is in sight.

Of the owls, the large white or snowy Owl, (Stryx Nyctea) is one of the most beautiful of our rapacious birds. Nothing can exceed the exquisite softness and beauty of its thick warm plumage, which enables it to bid defiance to the severest cold. Its colour varies slightly according to the age of the bird, but when full grown it is a rich creamy white, the edges of the feathers of the head and back tipped with crescent-shaped spots of brown, and the wings and tail barred with the same colour. This owl pursues its prey during the day as well as at dusk, and its flight is extremely rapid and noiseless. It is not over nice in its choice of food; squirrels, rats, mice, small birds, and fish, all seem equally welcome.

The great horned Owl (Stryx Virginiana,) is now, I believe, rarely found here. I once shot a very fine specimen in the shrubbery close to my own house—an unusual place to meet with one, as it is in general a solitary bird, preferring some thick wood on the edge of a clearing, from which it sallies forth in the fine moonlight nights in search of its prey. Their plumage is very handsome, the prevailing colour being a rich reddish brown, barred and mottled with brownish black and reddish yellow. The horns are broad, and three inches in length, formed of twelve or fourteen small feathers, with black webs and edged with brownish yellow.

The barred or grey Owl, (Stryx Nebulosa) is a very common visitor to our woods during the winter. It is generally found in pairs; it is a smaller bird than the horned owl, and its plumage, though very soft and warm, is much inferior in richness and beauty. Small birds and mice are its favourite food, but a stray chicken or young pigeon does not come amiss to him. It is the funniest possible thing, to watch the gesticulations of one of these birds, when approaching them in daylight. It bends its whole body forward, pulling up the lateral feathers of the head so as to form a sort of ruff; moving its head at the same time rapidly to and fro, and eyeing the intruder in the most grotesque manner.

The little horned owl is still found in this neighbourhood. It is an inoffensive little creature, generally keeping itself very quiet till towards evening, for should it be caught abroad during the day by other birds, they never fail to express their dislike and antipathy in a very decided manner. A few weeks ago, while giving directions to some work people at my own place, my attention was attracted by the loud screaming and chattering of a party of blue-jays, collected in some low pine bushes a few yards from where I was standing. On going up to the spot to ascertain the cause of the uproar, the jays flew off, and seeing neither hawk or cat, I returned again to my men. I had hardly done so before the jays were all back, and the screaming was renewed with ten-fold vigour. Determined to see what the matter was this time, I pushed my way through the bushes, and after looking carefully, but without success, in every direction for the cause of the disturbance, was on the point of giving it up in despair, when turning round suddenly, I almost brushed up against a beautiful little-horned owl, sitting bolt upright on a small branch close to the stem of a pine bush, and eying me with the most imperturbable gravity. This little fellow hardly measured ten inches; his plumage was exceedingly soft and beautiful, barred alternately with wavy lines of a rich brown, grey and black.

Of the hawk tribe, the most common is the Pigeon Hawk; (Falco Columbarius) one or more solitary individuals hang about our woods and fields in the neighbourhood of the town all winter; and very fat and plump they become, making sad havoc amongst the flocks of red-polls and siskins, and every now and then paying an unwelcome visit to the nearest dove-cot. The colour of the adult male is generally a light bluish grey, each feather marked with a black central line, the lower parts reddish white, the breast and belly yellowish white marked with large oblong brown spots.

Among the birds of prey may properly be classed the great American Shrike, (Lanius Borealis,) for a bolder or more rapacious bird for its size does not exist. Many years ago I was fortunate enough to procure a very fine specimen; I then lost sight of the bird for several years, and almost despaired of meeting with it again, when, one fine winter's morning, a very large one dashed through a pane of glass at a pet goldfinch, whose cage happened to stand close to the window, in one of the rooms at my own house. Being a little stunned with the shock, and his wings slightly injured by the broken glass, I secured him without much difficulty. He was a remarkably fine bird, measuring rather more than ten inches, and nearly fifteen inches across the wings. The upper part of the head and body was a clear bluish grey, the sides of the head nearly white, crossed with a bar of black, passing from the nostril through the eye to the middle of the neck; the belly nearly white, marked with narrow wavy dark lines; wings black, with a white bar; the two centre feathers of the tail all black; the rest black edged with white.

The next birds I shall notice are the Jays: of these we have two kinds; one remaining with us all the year round, the other only a winter bird. The Canada Jay, (Garrulus Canadensis) or Whiskey-Jack, as he is called in the north-west, is never met with here except in the depth of winter; and, even then, it must be very severe weather that drives these birds as far south as this.

They appeared in great numbers in the winters of 1839 and '40, flying about the woods and fields in flocks of fifteen or twenty, feeding upon seeds, berries and the larvae of insects. At other times frequenting the country roads, picking up the scattered grains from among the droppings of the horses, and often coming boldly to the very doors of the farm houses, in search of *crumbs or scraps of meat. Its plumage is well calculated to* resist the severest cold, the bird being a perfect bag of feathers, which, about the head particularly, are so loose and uneven, as to give it a peculiarly inelegant ragged look. Its colour is a dirty ash inclining to drab, the breast and belly dirty white.

The blue jay, (Garrulus Cristatus) is too well known to require description.

He is one of the noisiest tenants of our woods; and his screaming notes may be heard just as frequently in the depth of winter as in the middle of summer. He has fortunately a most accommodating appetite; so that when his summer fare of cherries, strawberries, caterpillars and grubs, and still worse, the eggs of small birds, for which he has a decided relish, are not to be had, he takes quite as readily to beech nuts, acorns, the seeds of the pine, or the berries of the mountain ash.

I come now to a bird which may be classed as among the handsomest, and at the same time the rarest of our winter visitors, the Pine Grosbeak, (Pyrrhula Enucleator.) This hardy species is found throughout Labrador, and the Hudson's Bay Territory; and it is only in very severe seasons that it visits us. It was very abundant in this neighbourhood in the winter of 1839, visiting our gardens and orchards in large flocks, feeding upon the tender buds of the cherry, the apple, and other fruit trees. To the seeds of the apple they appeared particularly partial, any withered fruit that might have been left upon the trees being stripped off directly, and cut in pieces in search of their favourite food. Having observed that a party of them paid frequent visits to some lilac trees growing against the verandah of my father's house, for the sake of the seeds that were still hanging upon the trees, I had a quantity of broken pieces of apple scattered about the verandah. The next visit the birds paid, the lilacs were speedily deserted, and the pieces of apple disappeared in a wonderfully short space of time. I continued to have fresh supplies provided for them, and by degrees the number of my pensioners increased, until there were sometimes as many as twelve or fourteen feeding at the same time, and they ultimately became so tame, as to allow any of the family to watch them while feeding from the windows, although they were hardly two feet from them. I may mention, however, that notwithstanding their daily feed of apples the lilacs did not escape, for not content with the seeds, they stripped the trees so effectually of their flower buds that the following summer there was hardly a blossom to be seen.

The general colour of the plumage of this bird is a blueish slate colour on the back and sides, deepening into black on the wings and tail. The head, neck, shoulders, and top of the rump in the male bird are of a reddish orange, varied in some specimens with very beautiful delicate tints of carmine. In the female these markings, are much less vivid, generally yellowish orange with lighter tints of dirty yellow.

Their note is peculiarly soft and full, and the call note which they utter when flying resembles slightly that of the blue bird.

In former days, when thick pine woods occupied the greater part of the space half-a-mile to the north of Queen Street, lying between Yonge Street and the Don, the Crossbill (Loxia Curvirostra,) was a constant and well known visitor. Even then it was a difficult bird to obtain a specimen of, as it generally frequented the tops of the loftiest pines, feeding upon the seeds contained in the pine cones, their strong crooked bills enabling them to force open the scales with ease.

The plumage of the male bird is exceedingly handsome, particularly towards the approach of spring, when the colouring becomes much more vivid.

The general colour of the body is olive, inclining to greenish grey, the head, throat, upper part of the back, and top of the rump a reddish orange, deepening into scarlet. The female is much plainer, the body being greenish grey, and the markings on the head and back pale yellow.

A frequent companion of the Crossbill is the Pine Linnet, (Linaria Pinus); it also feeds upon the seeds of the pine, as well as the buds of the alder. larch and poplar. It is a pretty, graceful little bird, the plumage greenish yellow, marked with dark olive brown, the breast and belly white with brown spots, the wings and tail brown, edged with yellow. In its flight it resembles the Goldfinch, rising and falling in deep curves like that bird, and emitting its call note at each fresh effort it makes to propel itself.

The lesser Red Poll, (Fringilla linaria) is not unlike the Siskin in some of its habits; and in the spring of the year the latter, deserting its friends the Crossbills, is often seen feeding very lovingly in company with the Red Poll and the Gold Finch. The Red Poll always flies in flocks, and is a hardy merry little creature, feeding upon the seeds of various grasses, berries, and the buds of different trees. In very stormy weather, when the snow is deep in the woods and fields, they may be seen about the streets of the town, often venturing into the outhouses in search of crumbs, or about our poultry yards, picking up any stray grains that the fowls may have left.

Their call note is almost precisely the same as that of the Goldfinch, which they also resemble in their flight. The rose colour on the head and breast deepens into crimson at the approach of spring. The bird, I believe, breeds here, although I have never been fortunate enough to find a nest.

The Goldfinch (Fringilla Tristis) remains with us all the year round, but in winter the Cockbird doffs his gay summer plumage, and puts on the sober brown suit of the female. It feeds at this season of the year, like the Red Poll and Siskin, upon seeds of different kinds, as well as the buds of the Alder birch, and poplar. In flight and song it closely resembles its European namesake, rising and falling in long graceful curves, uttering at the same time its call note, and often singing sweetly while on the wing. Like its European relative, it is extravagantly fond of the seed of the thistle. It tears up withered petals of the ripened flowers with great dexterity, and leaning downwards upon them eats off the seeds, allowing the down to float away.

We come now to a merry little fellow, familiar to most of us, the black capped Titmouse, (Parus atracapillus,) or Chickadee, as the country people call him. The colder and more stormy the weather, the merrier does this hardy restless little bird appear. They keep together generally in little flocks of five or six, flying from tree to tree, and branch to branch, repeating their quick lively note, peeping into every little chink and crevice in the bark, frequently hanging head downwards at the extremity of a twig, with their feet almost up to their bills, pecking at a berry or a seed. They have a most accommodating appetite, feeding upon insects, their larvæ and eggs, berries and seeds, and even upon scraps thrown out from the kitchen ; indeed I have often seen a Titmouse pecking away at a dish of bones that had been placed in the yard for the dog. Although shy enough at other times, the Titmouse become quites familiar in winter, alighting close to you without hesitation, and if you remain perfectly motionless, will pick up a seed or a berry almost from between your feet. It is Audubon, I think, who mentions an anecdote related to him by a friend of his, who while out shooting, and passing through a newly felled wood over which a fire had recently passed, and left everything black, in its course,—saw a small flock of Titmice coming from the opposite side of the clearing. Being dressed in dark clothes and aware of their familiarity, he stood perfectly motionless, for the purpose of ascertaining how near they would approach. Stealing from branch to branch, and pecking for food among the crevices of the prostrate trunks as they passed along, onward they came, until the foremost settled upon a small twig, a few feet from the spot upon which he stood. After looking about for a short time, it flew and alighted just below the lock of a double-barrelled gun, which he held in a slanting direction below his arm, being unable, however, to obtain a hold, it slid down to the middle of the piece, and then flew away, jerking its tail and apparently quite unconscious of having been so near the deadly weapon.

The next I shall notice, are the Sparrows and Buntings.

Of the Sparrows, the Tree Sparrow, (Fringilla Canadensis,) is the only one that braves our winters. Large numbers of them *do* migrate to the middle and southern States, but small parties of ten or twelve, may often be seen among our shrubberies and gardens. It is such a well known bird that I need not stop to describe it.

As soon as the first hard frosts have stiffened the ground, that harbinger of winter, the Snow Bunting, (Eruberiza Nivalis,) makes its appearance, flying high in large flocks, their white bodies shewing against the clear blue sky, they look almost like large feathery flakes of the substance from which they derive their name. They seldom or never enter the woods, preferring wide open clearings, or the shores of the lake. The peninsula on the opposite side of our harbour, is a very favorite resort of this bird. They feed on grains, grass seeds, and the larvæ of insects.

Early in March, or even in February, if the season be a mild one, the Snow Bunting begins towing its way towards the desolate regions of the far north; as early as the middle of February, some straggling flocks have been seen in the neighbourhood of the Saskatchewan, on their way to the northward, and by the beginning of May, they have perhaps penetrated to the very shores of the Polar Sea. Only one nest of this bird, according to Audubon, has ever been found in the United States, that was seen by a gentleman of Boston, on the summit of one of the White Mountains, in New Hampshire. Richardson, gives Southampton Island, in the 62nd parallel of latitude, as the most southerly of their breeding stations. Captain Lyons found a nest there, strangely enough, placed in the bosom of an exposed corpse of an Esquimaux child.

Of the Wood-Pecker tribe, there is one industrious little hunter, the Hairy Wood Pecker, (Picus Villosus,) who may be seen hard at work in the very coldest weather, tapping and chiselling away, flying from tree to tree, and dodging from one branch to another, uttering its peculiar sharp shrill cry, and seeming possessed with the very spirit of restlessness, the colour of the plumage is varied black and white, with a small red band at the back of the head.

There is a still smaller species, the downy Wood-pecker, (Picus pubescens) which resembles the Hairy Wood-pecker so closely in plumage, that it can only be distinguished by the difference in size, this species not measuring more than six inches.

Nearly allied to the Wood-peckers are the Nuthatches. Of these the red-bellied Nuthatch (Sitta Canadensis) seldom deserts us. A few migrate to the middle American States, but through the greater part of the winter, their curious nasal "kank" may be heard in our woods. If you follow up the sound you will be sure to find the little fellow creeping round the trunk of some old tree searching for spiders, or the eggs or larvæ of insects, concealed in the crevices of the bark.

I was not aware, until this winter, that that pretty elegant bird, the Cedar or Cherry Bird, (Bombycilla Carolinensis) ever ventured to remain so far north beyond the autumn months. This winter, however, I have noticed a small flock feeding upon the berries of some mountain ash trees, close to my own house. Their congeners, the large European Wax-wing, (Bombycilla garrula) have been seen here occasionally. They are a larger bird than the common Chatterer, but the plumage is almost precisely the same, and they both have the curious vermillion appendages, resembling sealing wax, on the secondaries of the wings.

Of the game birds the Ruffled Grouse, (Tetrao Umbellus) the Spruce Grouse, (Tetrao Canadensis) and the Quail, (Ortyx Virginiana) are all constant sojourners with us, being generally seen in greater numbers in winter, as they then come nearer the haunts of man than at any other season of the year.

I am afraid, however, they will soon cease to be among the number of our feathered visitors, either in winter or summer.

The Ruffed Grouse used to be found among the pine and hemlock woods, lying between the cemetery and Castle Frank, and in many places along the banks both of the Don and Humber. But increasing population and extended cultivation, have driven them from all their old haunts, and the sportsman or the naturalist, must now seek in more remote and less settled districts, for this noble game bird.

I hardly know whether I am correct in enumerating the spotted grouse, or spruce partridge, as it is commonly called, as among the number of the birds found in the immediate neighbourhood of Toronto. I have never shot one myself, but I have had specimens brought to me, which were said to have been procured not very many miles from here.

Their favourite resorts, are the deepest pine and spruce woods and cedar swamps, where they feed upon the buds and seeds of the different evergreens, a diet which renders them at certain seasons of the year not very palatable eating.

They are very handsome birds. Their general colour is a black brown and grey mingled in transverse wavy bands and spots. The cock bird has a small red bare space over each eye like the European moor fowl.

The Quail is still occasionally heard uttering its plaintive cry in autumn and winter about our woods and fields. In former days large coveys used to remain in the stubble fields and about our barn yards, from October until March, but like other game birds, they have experienced no mercy at the hands of those gentry who shoot for the market, and I fear that in the course of a few years, they will have disappeared altogether from this neighbourhood.

I made great efforts about three or four years ago, to keep them about the woods at my own place, and so far succeeded that they bred there for one spring, and I had the pleasure of seeing a number of young birds flying about the following summer, apparently quite contented with their quarters, and but little inclined to stray beyond them.

During my subsequent absence from home, however, some of the before-mentioned gentry got into the wood, and shot half the birds, and the rest of the scattered and frightened covey betook themselves to a safer and more distant cover, and have never since returned to their old haunts.

I have now briefly adverted to most of the different species of land-birds to be met with in this neighbourhood, from November to March. Many of them, like the game-birds, are becoming more rare every year, seeking in less populous districts for the shelter and food which their former haunts no longer afford them.

I trust that the attempt made in the present communication to contribute in some slight degree to our acquaintance with this interesting department of Natural History, may have the effect of inducing other members of the Institute, better qualified for the task, to exert themselves in adding, by their personal observation, to our knowledge of Canadian Ornithology, while the facilities for doing so are still, comparatively, so many and so great.

Directions for collecting, preserving and transporting Specimens of Natural History.*

§ I. INSTRUMENTS, PRESERVATIVE MATERIALS, &C.

1. Implements for Skinning.—The implements necessary in skinning vertebrated animals are: 1. A knife, such as is used for ordinary dissection, and which may be replaced, in extreme cases, by a penknife. 2. A pair of sharp-pointed scissors, and one with strong short blades. 3. Needles and thread for sewing up the incisions in the skin. 4. A hook by which to suspend the carcase of the animal while the operation of skinning is going on. To prepare the hook, take a string, of from one to three feet in length, and fasten one end of it to a stout fish-hook which has had the barb broken off. By means of a loop at the other end, the string may be suspended to a nail or awl, which, when the hook is inserted into the body of an animal, will give free use of both hands in the operation of skinning.

2. Preservatives.—The best material for the preservation of skins of animals consists of powdered arsenious acid, or the common arsenic of the shops. This may be used in two ways, either applied in dry powder to the moist skin, or else mixed with alcohol or water to the consistency of molasses, and put on with a brush. To the alcoholic solution should be added a little camphor. There are no satisfactory substitutes for arsenic; but, in its entire absence, corrosive sublimate, arsenical soap, camphor, alum, &c., may be employed.

The proper materials for stuffing out skins will depend much upon the size of the animal. For small birds and mammalia, cotton will be found most convenient; for the larger, tow. For those still larger, dry grass, straw, sawdust, bran, or other vegetable substances, may be used. Whatever substance is used, care must be taken that it be perfectly dry. In no event should animal matter, as hair, wool, or feathers, be employed.

§ II. SKINNING AND STUFFING.

1. Birds.—Whenever convenient, the following notes should be made previous to commencing the operation of skinning, as they will add much to the value of the specimens:—

1. The length, in inches, from tip of bill to the end of the tail; the distance between the two extremities of the outstretched wings; and the length of the wing from the carpal-joint. The numbers may be recorded as follows: 44, 66, 12 (as for a swan), without any explanation; it being well understood that the above measurements follow each other in a fixed succession. These numbers may be written on the back of the label appended to each specimen.

2. The color of the eyes, that of the feet, bill, gums, membranes, caruncles, &c.

3. Are the heels covered or uncovered by the feathers of the belly?

4. Attitude of the body when at rest, whether vertical, oblique, or horizontal. Does the bird perch or not?

5. Position of the wings, whether supported or hanging, crossing on the tail or not. Are they continuous, and covered by the feathers of the mantle (back) and breast for the upper third, the half, or the two-thirds of their length? Their extremity; does it reach the end of the tail, the half, or the fourth of its length? The three last points will be of great use in mounting the specimens.

Immediately after a bird is shot, the holes made by the shot should be plugged up, and the mouth and posterior nostrils plugged with cotton, to prevent the escape of blood and the juices of the stomach. A long narrow paper cone should be made; the bird, if small enough, thrust in, head foremost, and the open end folded shut, taking care not to break or bend the tail feathers in the operation.*

When ready to proceed to skinning, remove the old cotton from the throat, mouth, and nostrils, and replace it by fresh. Then take the dimensions from the point of the bill to the end of the tail, from the tip of one wing to that of the other, when both are extended, and from the tip of the wing to the first or carpal-joint, as already indicated.

This being done, make an incision through the skin only, from the lower end of the breast bone to the anus. Should the intestines protrude in small specimens, they had better be extracted, great care being taken not to soil the feathers. Now proceed carefully to separate the skin on each side from the subjacent parts, until you reach the knee, and expose the thigh; when, taking the leg in one hand, push or thrust the knee up on the abdomen, and loosen the skin around it until you can place the scissors or knife underneath, and separate the joint with the accompanying muscles. Place a little cotton between the skin and body to prevent adhesion. Loosen the skin about the base of the tail, and cut through the vertebræ at the last joint, taking care not to sever the bases of the quills. Suspend the body by inserting the hook into the lower part of the back or rump, and invert the skin, loosening it carefully from the body. On reaching the wings, which had better be relaxed previously by stretching and pulling, loosen the skin from around the first bone, and cut through the middle of it, or, if the bird be small enough, separate it from the next at the elbow. Continue the inversion of the skin by drawing it over the neck, until the skull is exposed. Arrived at this point, detach the delicate membrane of the ear from its cavity in the skull, if possible, without cutting or tearing it; then, by means of the thumb-nails, loosen the adhesion of the skin to the other parts of the head, until you come to the very base of the mandibles, taking care to cut through the white nictitating membrane of the eye when exposed, without lacerating the ball. Scoop out the eyes, and by making one cut on each side of the head, through the small bone connecting the base of the lower jaw with the skull, another through the roof of the mouth at the base of the upper mandible, and between the jaws of the lower, and a fourth through the skull behind the orbits, and parallel to the roof of the mouth, you will have freed the skull from all the accompanying brain and muscle. Should anything still adhere, it may be removed separately. In making the two first cuts, care must be taken not to injure or sever the zygoma, a small bone extending from the base of the upper mandible to the base of the lower jaw-bone. Clean off every particle of muscle and fat from the head and neck, and, applying the preservative abundantly to the skull, inside and out, as well as to the skin, restore these parts to their natural position. In all the preceding operations, the skin should be handled as near the point of adhesion as possible, especial care being taken not to stretch it.

The next operation is to connect the two wings inside of the

---

* Prepared for the use of the Smithsonian Institution.

* Crumpled or bent feathers may have much of their elasticity and original shape restored by dipping in hot water.

skin by means of a string, which should be passed between the lower ends of the two bones joining the forearm, previously, however, cutting off the stump of the arm, if still adhering at the elbow. Tie the two ends of the string so that the wings shall be kept at the same distance apart, as when attached to the body. Skin the leg down to the scaly part, or tarsus, and remove all the muscle. Apply the arsenic to the bone and skin, and, wrapping cotton round the bone, pull it back to its place. Remove all the muscle and fat which may adhere to the base of the tail or the skin, and put on plenty of the preservative wherever this can be done. Lift up the wing, and remove the muscle from the forearm by making an incision along it, or, in many cases, the two joints may be exposed by carefully slipping down the skin towards the wrist-joint, the adhesion of the quills to the bone being loosened.

The bird is now to be restored to something like its natural shape by means of a filling of cotton or tow. Begin by opening the mouth and putting cotton into the orbits and upper part of the throat, until these parts have their natural shape. Next take tow or cotton, and, after making a roll rather less in thickness than the original neck, put it into the skin, and push firmly into the base of the skull. By means of this you can reduce or contract the neck if too much stretched. Fill the body with cotton, not quite to its original dimensions, and sew up the incision in the skin, commencing at the upper end, and passing the needle from the inside outwards; tie the legs and mandibles together, adjust the feathers, and, after preparing a cylinder of paper the size of the bird, push the skin into it so as to bind the wings closely to the sides. The cotton may be put in loosely, or a body the size of the original made by wrapping with threads. If the bird have long legs and neck, they had better be folded down over the body, and allowed to dry in that position. Economy of space is a great object in keeping skins, and such birds as herons, geese, swans, &c., occupy too much room when all their parts are in a natural position.

In some instances, as among the ducks, woodpeckers, &c., the head is so large that the skin of the neck cannot be drawn over it. In such cases, skin the neck down to the base of the skull, and cut it off there. Then draw the head out again, and making an incision on the outside, down the back of the skull, skin the head. Be careful not to make too long a cut, and to sew up the incision again.

2. Mammals.—The mode of preparing mammals is precisely the same as the preceding, in all its general features. Care should be taken not to make too large an incision along the abdomen. The principal difficulty will be experienced in skinning the tail. To effect this, pass the slip-knot of a piece of strong twine over the severed end of the tail, and, fastening the vertebræ firmly to some support, pull the twine towards the tip until the skin is forced off. Should the animal be large, and an abundance of preservative not at hand, the skin had better remain inverted. In all cases, it should be thoroughly and rapidly dried.

Skins may also be preserved, for a time, in spirits, in the absence of other preservative. This would, at all events, be better than their drying, especially in localities abounding in noxious insects.

For the continued preservation of hair or fur of animals against the attacks of moths and other destructive insects, it will be necessary to soak the skins in a solution of corrosive sublimate, in alcohol or whisky, allowing them to remain from one day to several weeks, according to the size. After removal, the hair must be thoroughly washed or rinsed in clean water, to remove as much as possible of the sublimate; otherwise, exposure to light will bleach all the colors.

In some instances, large skins may be preserved by being salted down in casks.

With regard to the tails of mammalia, it may be well to remark that in some it can never be forced off in the common way of doing this operation. This is particularly the case with *beavers*, *opossums*, and those species which use their tail for prehension or locomotion. Here the tail is usually supplied with numerous tendinous muscles, which require it to be skinned by making a cut along the lower surface or right side of that organ, nearly from one end to the other, and removing the bone and flesh. It should then be sewed up again, after a previous stuffing.

3. Reptiles.—The larger *lizards*, as those exceeding twelve or eighteen inches in length, may be skinned according to the principles above presented, although preservation in spirits, when possible, is preferable for all reptiles.

Large *frogs* and *salamanders* may likewise be skinned, altho' cases where this will be advisable are very rare.

Turtles and *large snakes* will require this operation.

To one accustomed to the skinning of birds, the skinning of frogs or other reptiles will present no difficulties.

The skinning of a snake is still easier. Open the mouth and separate the skull from the vertebral column, detaching all surrounding muscles adherent to the skin. Next, tie a string around the stump of the neck, and, holding on by this, strip the skin down to the extremity of the tail. The skin thus inverted should be restored to its proper state, and then put in spirit or stuffed, as convenient. Skins of reptiles may be stuffed with either sand or sawdust, by the use of which their shape is more easily restored.

Turtles and tortoises are more difficult to prepare in this way, although their skinning can be done quite rapidly. "The breastplate must be separated by a knife or saw from the back, and, when the viscera and fleshy parts have been removed, restored to its position. The skin of the head and neck must be turned inside out, as far as the head, and the vertebræ and flesh of the neck should be detached from the head, which after being freed from the flesh, the brain, and the tongue, may be preserved with the skin of the neck. In skinning the legs and the tail, the skin must be turned inside out, and, the flesh having been removed from the bones, they are to be returned to their places by redrawing the skin over them, first winding a little cotton or tow around the bones to prevent the skin adhering to them when it dries."—Richard Owen.

Another way of preparing these reptiles is as follows: Make two incisions, one from the anterior end of the breastplate to the symphysis of the lower jaw, and another from the posterior end of the breastplate to the vent or tip of the tail; skin off these regions and remove all fleshy parts and viscera without touching the breastplate itself. Apply preservative, stuff, and sew up again both incisions.

"When turtles, tortoises, crocodiles, or alligators, are too large to be preserved whole in liquor, some parts, as the head, the whole viscera stripped down from the neck to the vent, and the cloaca, should be put into spirit or solution."—R. Owen.

4. Fishes.—As a general rule fishes, when not too large, are best preserved entire in spirits.

Nevertheless they may be usefully skinned and form collections, the value of which is not generally appreciated. In many cases, too, when spirit or solutions cannot be procured, a fish may be preserved which would otherwise be lost.

There are two modes of taking the skin off a fish: 1st. The whole animal can be skinned and stuffed like a bird, mammal, or reptile. 2d. One half of the fish can be skinned, and nevertheless its natural form preserved.

Sharks, skates, sturgeons, garpikes or *garfishes, mudfishes,* and all those belonging to the natural orders of *Placoids* and *Ganoids* should undergo the same process as given above for birds, mammals, and reptiles. An incision should be made along the right side, the left always remaining intact, or along the belly. The skin is next removed from the flesh, the fins cut at their bases under the skin, and the latter inverted until the base of the skull is exposed. The inner cavity of the head should be cleaned, an application of preservative be made, and the whole, after being stuffed in the ordinary way, sewed up again. Fins may be expanded when wet on a piece of stiff paper, which will keep them sufficiently stretched for the purpose. A varnish may be passed over the whole body and fins, to preserve somewhat the color.

In the case of *Ctenoids*, perches and allied genera; and *Cycloids*, trouts, suckers, and allied genera; one-half of the fish may be skinned and preserved. To effect this, lay the fish on a table with the left side up; the one it is intended to preserve. Spread out the fins by putting underneath each a piece of paper, to which it will adhere on drying. When the fins are dried, turn the fish over, cut with scissors or a knife all around the body, a little within the dorsal and ventral lines, from the upper and posterior part of the head, along the back to the tail, across the base of the caudal fin down, and thence along the belly to the lower part of the head again. The dorsal, caudal, and anal fins, cut below their articulations. This done, separate the whole of the body from the left side of the skin, commencing at the tail. When near the head, cut off the body with the right ventral and pectoral fins, and proceed by making a section of the head and removing nearly the half of it. Clean the inside, and pull out the left eye, leaving only the *cornea* and pupil. Cut a circular piece of black paper of the size of the orbit, and place it close to the pupil. Apply the preservative, fill the head with cotton as well as the body. Turn over the skin and fix it on a board prepared for that purpose. Pin or tack it down at the base of the fins. Have several narrow bands of paper to place across the body in order to give it a natural form, and let it dry. The skins may be taken off the board or remain fixed to it, when sent to their destination, where they should be placed on suitable boards of proper size, for permanent preservation.

Such a collection of well-prepared fish will be useful to the practical naturalist, and illustrate, in a more complete manner to the public, the diversified forms and characters of the class of Fishes, which specimens preserved in alcohol do not so readily show.

§ III. PRESERVING IN LIQUIDS, AND BY OTHER MODES BESIDES SKINNING.

1. General Remarks.—The best material for preserving animals of moderate size is alcohol. Next to this, rum or whisky (the stronger the better) may be employed. When spirits cannot be obtained, the following substitutes may be used:—

I. Goadby's Solution.—A. *The aluminous fluid*, composed of rock salt 4 oz.; alum 2 oz.; corrosive sublimate 4 grains; boiling water 2 quarts. B. *The saline solution*, composed of rock salt 8 oz.; corrosive sublimate 2 grains; boiling water 1 quart. To be well stirred, strained, and cooled.

II. A strong brine, to be used as hereafter indicated for Goadby's Solution.

III. In extreme cases, dry salt may be used, as in salting herring, &c.

To use Goadby's Solution, the animal should first be macerated for a few hours in fresh water, to which about half its volume of the concentrated solution may then be added. After soaking thus for some days, the specimens may be transferred to fresh concentrated solution. When the aluminous fluid is used to preserve vertebrate animals, these should not remain in it for more than a few days; after this, they are to be soaked in fresh water, and transferred to the saline solution. An immersion of some weeks in the aluminous fluid will cause a destruction of the bones. Specimens must be kept submerged in these fluids. The success of the operation will depend very much upon the use of a weak solution in the first instance, and a change to the saturated fluid by one or two intermediate steps.

The collector should have a small keg, jar, tin box, or other suitable vessel, partially filled with liquor, into which specimens may be thrown as collected. They should be alive, or as near it as possible when this is done, as besides the speedy and little painful death, the animal will be more apt to keep sound. The entrance of the spirit into the cavities of the body should be facilitated by opening the mouth, making a small incision in the abdomen a half or one inch long, and especially by injecting the liquor into the intestines through the anus, by means of a small syringe. After the animal has soaked for some weeks in this liquor, it should be transferred to fresh. Care should be taken not to crowd the specimens too much, and the slightest taint of putridity should be the signal for the employment of fresh spirits. When it is impossible to transfer specimens to fresh spirits from time to time, the strongest alcohol should be originally used.

To pack the specimens for transportation, procure a small keg, which has been properly swelled by allowing water to stand in it for a day or two, and from this extract the head by knocking off the upper hoops. Great care must be taken to make such marks on the hoops and head, as will assist in their being replaced in precisely the same relative position to each other and the keg, that they originally held. At the bottom of the keg place a layer of tow moistened in liquor, then one of specimens, then another of tow and another of specimens, and so on alternately until the keg is filled. Replace the head, drive down the hoops, and fill completely with spirits, by pouring through the bunghole. Allow it to stand at least half an hour, and then, supplying the deficiency of the liquor, insert the bung, and fasten it securely. An oyster-can or other tin vessel may be used to great advantage, in which case the aperture should be soldered up and the vessel inclosed in a box. A glass jar or bottle may also be employed, but there is always a risk of breaking and leaking. In the absence of tow, chopped straw, fine shavings, or dry grass may be substituted.

It is sometimes necessary to guard against the theft of spirits employed, by individuals to whom the presence of reptiles and fishes in the liquor is no objection. This may be done by adding a small quantity of tartar emetic, ipecacuanha, quassia, or some other disagreeable substance. The addition of corrosive sublimate will add to the preservative power of the spirit.

Should the specimens to be packed vary in size, the largest should be placed at the bottom. If the disproportion be very great, the delicate objects at the top must be separated from those below, by means of some immovable partition, which in the event of the vessel being inverted will prevent crushing. The most imperative rule, however, in packing, is to have the vessel perfectly full of something, any vacancy occupied only by air exposing the whole to the risk of loss. In carrying specimens in liquor when travelling, an almost insuperable difficulty is found in preventing rubbing, owing to the necessity of leaving enough space for the addition of specimens. This danger may be obviated by introducing an India-rubber, or oiled silk bag or bladder, provided with a valve, and blowing it up enough to fill the unoccupied space.

It often becomes a matter of great importance to separate the specimens of one locality from those of another, in the same vessel. This may be readily done by having a number of small bags made of mosquito net stuff, lino, or other porous material, and from six to twenty inches long, by two to six wide. They are made like pillow-cases, open at one end, and sewed around the other three edges with coarse stitches. The specimens, on being gathered, may be put into a bag of proper size, and the mouth closed by tying a piece of thread. A number may be marked on the bag with a pencil, or with ink on a parchment label, placed inside or tied to one corner. These bags are of incalculable service on a march, or in transporting collections, the *individuals of which* are to be kept separate for any purpose whatever.

2. Vertebrata.—Fishes under six inches in length need not have the abdominal incision. Specimens with the scales and fins perfect should be selected, and, if convenient, stitched or pinned in bits of muslin, &c., to preserve the scales. In general, fishes under twelve or fifteen inches in length should be chosen. The skins of larger ones may be put in liquor. It is important to collect even the smallest.

With regard to the *sharks* and *skates*, it will be best to take the jaws and vertebral column as well as their skins. But, as it very often happens that bodies in a state of decomposition are met with upon the beaches or shores, it should then never be neglected to take these hard parts. The tail of skates is also desirable. If convenient, some vertebræ and teeth may be preserved in spirits for microscopic examination.

Reptiles, as already observed, should be preserved in liquids when their size does not forbid this mode of preservation. Persons at leisure may find pleasure in preparing the skins of many small kinds as a double series.

A collection of birds in alcohol or spirit would be a valuable acquisition to a public collection, as much is still to be learned with regard to their anatomical structure. There are no birds, with the exception of the large ostriches, which could not be collected for that purpose. This is a matter to which the collector should be especially attentive. Skins, however, of the first few individuals of rare species should be secured. And on a march it will not often be convenient to preserve specimens in spirit, as the space allotted for collections in alcohol is generally required for reptiles, fishes, small mammalia, and invertebrata.

3. Invertebrata.—*Insects, Bugs, &c.*—The harder kinds may be put in liquor, as above, but the vessel or bottles should not be very large. Butterflies, wasps, flies, &c., may be pinned in boxes, or packed in layers with soft paper or cotton. Minute kinds should be carefully sought under stones, bark, dung, or flowers, or swept with a small net from grass or leaves. They may be put in quills, or small cones of paper, one in each. They may be killed by immersing the bottles, &c., in which they are collected, in hot water, or exposing them to the vapor of ether.

It will frequently be found convenient to preserve or transport insects pinned down in boxes. The bottoms of these are best lined with cork or soft wood.

The traveller will find it very convenient to carry about him a vial having a broad mouth, closed by a tight cork. In this, should be contained a piece of camphor, or, still better, of sponge soaked in ether, to kill the insects collected. From this, the specimens should be transferred to other bottles.

Ether will be found most effective in killing all insects that cannot or ought not to be immersed in alcohol. All those that can support the immersion in this liquid without injury may readily be killed in this way.

The camphor should always be fixed in the box containing insects, as it would break the feet and antennæ of the latter if in a loose and crystalline state. It may be kept in a piece of muslin or canvas, and then pinned at the bottom of the box.

Marine shells, crabs, worms, sea cucumbers, star fishes, sea urchins, and polypes, should be put in spirit and in small vessels, so as to prevent too great pressure. Sea urchins and star fishes may also be dried after having been previously immersed for a minute or two in boiling water, and packed up in cotton, or any soft material which may be at hand.

The hard parts of corals, and shells of mollusca, may alone be preserved in a dried state. The soft parts are removed by *immersing the* animals for a minute or two in hot water, and washed clean afterwards. The valves of bivalve shells should be brought together by a string.

Spiders, scorpions, centipedes or thousand-legs, earth-worms, hair-worms, and generally all worm-like animals to be met in fresh waters, either clear and running, or still and putrid, cannot be better preserved than in the strongest alcoholic liquor, and in small bottles or vials.

§ IV. EMBRYOS.

Much of the future progress of zoology will depend upon the extent and variety of the collections which may be made of the embryos and fœtuses of animals. No opportunity should be omitted to procure these and preserve them in spirits. All stages of development will be equally interesting, and complete series for the same species are of the highest interest. Not only the domestic mammalia, as horse, cow, sheep, hog, dog, &c., should be collected, but also any of the wild animals, as deer, bears, wolves, foxes, antelope, and any and every species. Whenever any females of such mammalia are killed, the uterus should be examined for embryos, and the smaller or more minute, in many cases, the more interesting. When eggs of birds, reptiles or fish, are emptied of their young, these should be preserved. It will be sufficiently evident that great care is required to label the specimens, as in most cases it will be impossible to determine the species from the zoological characters.

§ V. NESTS AND EGGS.

Nothing forms a more attractive feature in a museum, or is more acceptable to amateurs, than the nests and eggs of birds. These should be collected whenever they present themselves, and in any amount procurable for each species, as they are always in demand for purposes of exchange. Hundreds of eggs of *any* species with their nests (or without, when not to be had) will be gladly received.

Nests require little preparation beyond packing so as to be secure from crumbling or injury. The eggs of each nest, when emptied, may be replaced in it and the remaining space filled with cotton.

Eggs, when fresh, and before the chick has formed, may be emptied by making a minute hole at each end, and blowing or sucking out the contents. Should hatching have already commenced, an aperture may be made in one side by carefully pricking with a fine needle round a small circle or ellipse, and thus cutting out a piece. The larger kinds should be well washed inside, and all allowed to dry before packing away. If the egg be too small for the name, a number should be marked with ink corresponding to a memorandum list. Little precaution is required in packing, beyond arranging in layers with cotton and having the box entirely filled.

The eggs of reptiles, provided with a calcareous shell, can be prepared in a similar way.

The eggs of fishes, salamanders and frogs, may be preserved in spirits, and kept in small vials or bottles. A label should never be omitted.

§ VI. SKELETONIZING.

Skulls of quadrupeds may be prepared by boiling in water for a few hours. A little potash, or ley, added, will facilitate the removal of the flesh.

Skeletons may be roughly prepared by skinning the animal and removing all the viscera, together with as much of the flesh as possible. The bones should then be exposed to the sun or air until completely dried. Previously, however, the brain of large animals should be removed by separating the skull from the spine, and extracting the contents through the large hole in the back of the head. In case it becomes necessary to disjoint a skeleton, care should be taken to attach a common mark to all the pieces, especially when more than one individual is packed in the same box.

Skulls and skeletons may frequently be picked up, already cleaned by other animals or exposure to weather. By placing small animals near an ant's nest, or in water occupied by tadpoles, or small crustacea, very beautiful skeletons may often be obtained. The sea beach sometimes affords rich treasures in the remains of porpoises, sharks, whales, large fishes, and other aquatic species.

§ VII. PLANTS.

The collector of plants requires but little apparatus; a few quires or reams of unsized paper, of folio size, will furnish all that will be required. The specimens, as gathered, may be placed in a tin-box, or, still better, in a portfolio of paper, until reaching home. Here they are to be spread out carefully between sheets of the paper, and these laid one on top of the other, with several sheets between each. The pile is now to be placed between two boards, and subjected to a pressure of fifty pounds or less. This may be given by weights, or by means of two straps, one at each end. In travelling, the straps will be found most convenient. The papers must be changed every day, and, when perfectly dry, transferred to fresh sheets. It will be found very convenient to have a number of blank labels, with strings attached, by which they may be fastened on a specimen when collected, as soon as notes of locality, color of flowers, date, &c., are made upon it.

In many instances, old newspapers will be found to answer a good purpose both in drying and in keeping plants, although the unprinted paper is best—the more porous and absorbent the better.

While on a march, the following directions for collecting plants, drawn up by Major Rich, are recommended:—

Have thick cartridge, or envelope paper, folded in *quarto* form, and kept close, and even by binding with strong cord; newspapers will answer, but are liable to chafe and wear out; a few are very convenient to mix in with the hard paper as dryers. This herbarium may be rolled up in the blanket while travelling and placed on a pack animal. The specimens collected along the road may be kept in the crown of the hat when without a collecting-box, and placed in paper at noon or at night. Great care should be taken to keep the papers dry and free from mould. When there is not time at noon to dry the papers in the sun, they should be dried at night by the fire, when, also, the dried specimens are placed at the bottom of the bundle, making room on top for the next day's collection. A tin collecting-box is very necessary; plants may be preserved for two or three days in one if kept damp and cool. It is also convenient in collecting *land-shells*, which is generally considered part of a botanist's duty. A collector should also always be provided with plenty of ready-made seed papers, not only for preserving seeds, but mosses and minute plants. Many seeds and fruits cannot be put in the herbarium, particularly if of a succulent nature, causing mouldiness, and others form irregularities and inequalities in the papers, thus breaking specimens and causing small ones and seeds to drop out. Fruits of this kind should be numbered to correspond with the specimen, and kept in the saddle bag or some such place. It is necessary, in order to make good specimens, to avoid heavy pressure and keep the papers well dried, otherwise they get mouldy, turn black, or decay.

On board ship, it is all-important to keep the collections from getting wet with salt-water. The papers can generally be dried at the galley. The whole herbarium should be exposed to the sun as often as possible, and frequently examined, and the mould brushed off with a feather or camel's-hair pencil.

§ VIII. MINERALS AND FOSSILS.

The collections in mineralogy and paleontology are amongst all, those which are most easily made; whilst, on the other hand, their weight, especially when on a march, will prevent many from making such upon an extensive scale.

All the preparation usually needed for preserving minerals and fossils consists in wrapping the specimens separately in paper, with a label inside for the locality, and packing so as to prevent rubbing. Crumbling fossils may be soaked to advantage in a solution of glue.

Any fossil, whatever it be, should be collected. Minerals and samples of rocks are also desirable. The latter should be properly selected, and cut to five by three inches of surface, and one to two inches thick.

Specimens ought to be tightly packed up in boxes, taking care that each one is wrapped up separately, in order that the angles or crystalline surfaces should not be destroyed by transportation; their value depending upon their good condition. The same precautions will be required for corals. The interstices between the specimens, in the box or cask, may be occupied by sawdust, sand, shavings, hay, cotton, or other soft substance. It is absolutely essential, for land carriage, that no cavity be left in the vessel, or box.

§ IX. DESIDERATA.

As comparatively little is known of the animals and plants of the country west of the Mississippi and Gulf of Mexico, the attention of officers of the army, and others, is especially invited to this region. Of the fresh water fishes, trout, grayling, minnows, &c., little or nothing is on record; and the same may be said of the marine species. The reptiles, birds, smaller mammalia (squirrels, marmots, gophers, pouched rats, hares, &c.,) and all other animals, should also be carefully collected.

This region likewise abounds in fossil bones, teeth, &c., of the greatest interest, especially in those portions known as "Mauvaises Terres," or "Bad Lands," and occurring along the Missouri and its tributaries, White River, Milk River, Platte, Eau qui Court, &c. The banks and beds of these and other streams likewise contain rich treasures of fossil bones. Similar remains are to be looked for in all caves, peat bogs, alluvial soil, marl pits, fissures in rocks, and other localities throughout North America.

A list of the principal species of large North American animals is subjoined, with reference to the collection of skins, skulls, horns, and skeletons. For the purpose of having complete series in the different stages of age and sex, and for supplying other museums, it is desirable to have a considerable number of the skulls of each species. When possible, at least one skeleton should be procured. It must, however, be remembered, that a single tooth or bone of an animal, in the absence of anything more, will be of importance. Each specimen should, as far as practicable, have the approximate age, sex, and locality, distinctly marked on the bone in pen or pencil.

HUMAN RACES, civilized and uncivilized.
BUFFALO.
MUSK OX.
MOUNTAIN SHEEP, or BIGHORN.
CALIFORNIA WILD SHEEP.
SEA OTTER.
COMMON OTTER.
GRIZZLY BEAR.
WHITE BEAR.
BEARS, other species.
RACCOON, especially from California.

Mountain Goat.
Antelope.
Elk.
Little Elk.
Moose.
Reindeer, or Carabou.
Black Tail Deer, of Rocky Mountains.
Black Tail Deer, of the Pacific.
Mule Deer.
White Tail Deer.
Deer, other species.
Beaver.
Prairie Dog.
Marmots.
Sewellel.
Hares.
Large Wolf, black, white, or gray.
Lobos Wolf.
Prairie Wolf.
Coyote.
Medicine Wolf.
Indian Dog.
Foxes, all species.
Badger.
Wolverine, or Carcajou.
Fisher.
Marten.
Panther.
Jaguar.
Ocelot.
Ounce.
Tiger Cat.
Wild Cat.
Lynx.
Civet Cat, or Bassaris.
Armadillo.
Peccary, or Mexican Hog.
Walrus, or Morse.
Seals.
Porpoises.
Dolphins.
Whales.
Manatee or Sea Cow.

Alligator.
Sharks, Stingrees, Rays, Devil Fish; teeth, jaws, and vertebræ.

Specimens of the following kinds, preserved in spirits, from all parts of North America, are particularly desired: Small Quadrupeds, as field mice, shrews, moles, bats, squirrels, weasels. Reptiles, as snakes, lizards, scorpions (so-called), frogs, toads, tree-frogs, and, above all, the salamanders, or lizards without scales, found in water, or under logs and stones, known by the various names of hellbender, young alligator, ground puppy, water puppy, &c. Fish of all kinds, such as the gars, perch, pike, sunfish, chubs, suckers, minnows, and other species.

Invertebrates in general, as crabs, crawfish, and crustacea in general, insects, worms, starfishes, shells, &c.

In addition to dried plants, it will be well always to gather seeds, acorns, nuts, pine cones, &c., which when sent in may be planted, and thus furnish important additions to Horticulture, as well as to Botany. They should be put up perfectly dry.

We have called especial attention to the country west of the Mississippi. Much is still to be done, however, in the east, and collections of any kind will be acceptable from all parts of the Continent.

§ X. GENERAL LIST OF APPARATUS.

We shall here present at one view a list of the principal apparatus and outfit required for collecting on the simplest scale, in the different kingdoms of nature. Fuller explanations of all will be found under their appropriate heads.

1. For Collecting.—Gun, with shot of various sizes, from buck to No. 10, as also the proper equipment of powder, percussion caps and wads. Rifle for large game.

Fishing rod and lines. The latter should be of different sizes, with a supply of extra hooks, and snoods.

Nets of various kinds; a seine of about seven feet long with a bag in the middle, will be found most useful for fish. Also a small pocket net for insects, &c., but strong enough for fishes. Some gauze nets for insects.

A casting net will be found useful in fishing.

Pocket vial for collecting insects when on a land exploration, and for small invertebrata when on the sea shore, or on the bank of a river or lake.

Pocket box lined with cork, for collecting insects which cannot well be immersed in spirits.

Larger boxes into which the contents of the preceding may be transferred.

A vial of ether, and

A few ounces of camphor, for killing insects, ether being used in the pocket vial and camphor in the box.

Insect pins of assorted sizes.

Blank labels of paper with strings, for plants and skins of animals.

Unsized paper for plants; a ream or more.

Portfolio with straps.

Labels of parchment for animals in liquids.

Hundred or more lino bags of various sizes.

Ten or more yards of lino.

India rubber bag.

2. For Preserving.—Knives.

Two pairs of scissors.

Needles and threads of various numbers.

Twine.

Hook with loop.

Arsenic (powdered), five or ten pounds put up in several tin canisters.

Corrosive sublimate (powdered), about half a pound.

Alcohol in a small keg or tin can.

Tartar emetic or ipecacuanha.

Alum.

Saltpetre.

Common salt. (The three latter substances will hardly be required with plenty of alcohol and arsenic.)

Cotton or tow.

On the Provincial Currency.

Read before the Canadian Institute, January 31st, 1853; by J. B. Cherriman, M.A., F.C.P.S., Fellow of St. John's College, Cambridge, and Deputy Professor of Mathematics and Natural Philosophy in the University of Toronto.

The evils consequent on the present state of our Provincial Currency are so flagrant, and their effects accumulating as our wealth and national prosperity increase, are also beginning to make themselves so severely felt, that the postponement of some change in the system, long ago acknowledged to be necessary, seems no longer possible. It is the object of this paper briefly to state the nature of the changes which can be made to remedy those evils, and to discuss the methods proposed or desirable for effecting such change.

It is evident that a currency ought to be regulated with reference to two distinct objects to be attained—first, to furnish the most easy and convenient mode of exchange from individual to individual within the country itself—secondly, to adopt a standard and notation, which may, as fa. as possible, fit into and cohere with the currencies of those countries with which our commercial relations are most intimate. The first will have regard mainly to the subdivisions of the unit chosen—the second, to the nature of the unit itself.

In considering the latter question, the countries whose currencies we have to look to are Great Britain and the United States; and a brief statement of the nature of the currency of each is necessary.

The Sterling Currency of Great Britain is based on a gold standard, namely, the £ sterling or the gold sovereign which contains 113 1-623 grs. of pure gold; this is taken to be equivalent to 20 shillings of silver, each shilling containing 80 8-11 grs. of pure silver; the shilling is again divided into 12 pence of copper and each penny again into four farthings, but the copper coinage may be left out of consideration as of inferior importance.

In the system of the United States, since the year 1834, the unit adopted as standard is the Silver Dollar, contain 371¼ grs. pure silver, and this is subdivided into 100 cents of copper. The Gold Coin which is also in use, is the Eagle, containing 232 1-5 grs. pure gold, and fixed by law as the equivalent of 10 dollars.

In each case although the standard is ostensibly of one metal, gold in sterling and silver in the other, yet by reason of the existence of these fixed legal equivalents of coins of the other metal to the standard, it is plain that each country in reality uses a double standard. Now, Gold and Silver, being metals each possessing an intrinsic value, will always like other commodities have a market value *relatively to each other*, a value which is quite independent of legislative enactments, and rarely if ever coincides with that fixed by law: so that the ratio between the metals is by law said to be constant, while in fact it is perpetually varying, and in all double currencies of this kind, *one metal is certain to* be undervalued as compared with the other. Thus it was in France and England, towards the close of the 18th century: England over-valued gold, and France over-valued silver, and the effect was the disappearance of gold from France and of silver from England. The inconvenience resulting in this way does not appear to be capable of evasion altogether; its effects are somewhat obviated in sterling by the enactment that silver is not a legal tender to the amount of more than £2, and this confines the evil within small limits, and renders a change in the amount of metal contained in one of the coins necessary only at long intervals. How it will then be effected is not stated, but most probably it will be by altering the amount of silver in the lesser coins. In the United States, however, no such restriction exists, nor indeed could it exist so long as the small coin is the standard, for all large payments are made in gold and no legal limitation to the amount of tender could possibly be made. Here, therefore, the evil exhibits itself in its full effects, and the only remedy will be by successive enactments reducing the amount of gold in the Eagle—this has already occurred even in the short period that has elapsed since the construction of the federal coinage, namely, in 1834, when the Eagle was reduced from 247½ grs. of pure gold to 232 1-5, more than 15 grs., or about 6¼ per cent. In this respect Great Britain seems to have a decided advantage over the States.*

"Before the discovery of the mines in America the value of gold as compared with that of silver seems to have varied in the different mines of Europe between the proportions of 1 to 10 and 1 to 12, but about the middle of the 17th century it came to be regulated at 1 to 14 or 15 from which it not has since varied much." In sterling an ounce of gold is worth a little more than 15 ozs. of silver, and in federal money, an oz. of gold is worth a little less than 16 ozs. of silver: it thus appears "that gold has been rising in its nominal value or in the quantity of silver exchanged for it: both metals have sunk in real value or in the amount of labour they could purchase, but silver has sunk more than gold." Whether the enormous discoveries of gold in Australia and California will check this downward tendency of silver is not easy to say.

The difference pointed out between the relative values of the two metals as regulated in England and America renders it difficult to institute a strict comparison between their respective coins. The £ sterling compared with the Eagle by means of the amounts of pure gold contained in each is worth $4 86⅔, which is its value as fixed by the United States Mint, and its legalized value is $4 84. Again, the sterling shilling compared with the silver dollar by the amounts of pure silver contained in each, should be worth 21.74 cents, while its legal value is 23 cents, and its mint value, calculated apparently on the English scale, is 24⅓.

With regard to the utility of each system for the convenience of internal traffic, the American is, without doubt, theoretically the most perfect that can be conceived, while the sterling subdivision of 4, 12 and 20 are about as awkward as can be. The sterling, however, has the advantage of possessing coins of more convenient amount, and embracing a larger range, the £ being much better than the dollar for large transactions, and the farthing more useful than the cent in retail trade. The reasons, however, which have caused the practical working of the American system to be so far removed from its theoretical perfection will be touched on bye and bye.

It is clear that the two systems cross each other in such an inextricable manner as to give no hope of accommodation between them, and the construction of any system to harmonize perfectly with both would be altogether an insane attempt; let us examine then how far our present Provincial Currency succeeds in the adaptation. I here speak of the Provincial Currency as established by the Acts 4th and 5th, 13th and 14th Victoria, and not of the various currencies of exchange in use in different departments, which it would be only a waste of time to enter into.

Our currency is subdivided by 20, 12, 4, starting from the £ with shillings, pence and farthings, thus adopting the sterling measure in its most objectionable part. The £ sterling is said to be the standard of value, and denominated £1 4s. 4d.: as the £ sterling might have been called by any other name, the denomination being quite arbitrary, it will be curious to examine the origin of this extraordinary number £1 4s. 4d. which is our unit. It appears to have taken its rise in the state paper-system adopted by the ancient British Colonies of America. "The paper currencies of North America, says Adam Smith, 'consisted, not in bank notes payable to the bearer on demand, but in a government paper, of which the payment was not exigible till several years after it was issued; and though the colony governments paid no interest to the holders of this paper, they declared it to be, and in fact rendered it, a legal tender of payment for the full value for which it was issued. But allowing the colony security to be perfectly good, £100, payable for example 15 years hence in a country where interest is at 6 per cent., is worth little more than £40 ready money. To oblige a creditor, therefore, to accept of this as full payment of a debt of £100 actually paid down in ready money was an act of such violent injustice as has scarce, perhaps, been attempted by the government of any other country which pretended to be free."

Of course this ingenious "scheme of fraudulent debtors to defraud their creditors," as Smith calls it, failed as all legislative interference with the natural laws of trade must fail, and in course of time the exchange with Great Britain varied so widely that £100 sterling came to be considered the equivalent in some colonies of £130, and in others of so great a sum as £1100 currency, this difference in the value arising from the difference in the quantity of paper emitted in the different colonies, and in the distance and probability of the term of its final discharge and redemption.

Another instance I will quote from the same authority.

The colony of Pennsylvania, before any emission of paper money, had raised the denomination of its coin and had, by act of assembly, ordered 5s. sterling to pass in the colonies for 6s. 3d., and afterwards for 6s. 8d. The pretence for doing so was to prevent the exportation of gold and silver, by making equal quantities of these metals pass for greater sums in the colony than they did in the mother country. It was found, however, that the price of all goods from the mother country rose exactly in pro-

* Since the above was written a Bill has passed the United States Senate, assimilating the practice of the States in this respect to that of Great Britain, and in effect abandoning the silver standard.

portion as they raised the denomination of their coin, so that their gold and silver were exported as fast as ever."

At length the course of exchange was fixed at £90 sterling for £100 currency, and this constitutes the bank par, the actual exchange being adapted to this by the addition of a premium, which has gradually risen to about 10½, from which it will not probably vary much in future. Taking the premium at 9½, that is, £90 stg. for £109½ currency, we have the value of £1 stg. to be £1 4s. 4d., nearly, which is now its legal value.

Taking the sterling standard of silver coin from our gold unit we find the crown or 5s. exactly 6s. 1d.

½ Crown .... 3s. 0½d.
Shilling .... 1s. 2d. 3-5ths.
Sixpence .... 0s. 7d. 3-10ths.

and these are also their values fixed by law except that the shilling and sixpence are made equal to 1s. 3d. and 7½d. for sake of convenience.

Turning to the United States money, we find the Eagle current at £2 10s., which is its correct value, as compared with the Sovereign; and, taking the American relation of silver to gold, this would make the dollar exactly 5s.; or, taking its value as compared with the current value of British silver, it would be worth about 5s. 7d.: we find it actually set down as legal tender for 5s. 1d.; the half-dollar for 2s. 6½d., and so on, the quarter being diminished to 1s. 3d., and the ⅛th of the dollar to 7½d. The cause of this strange anomaly I am quite unable to discover, but the effect of it is to keep both British and American gold out of circulation, 20s. stg. going further than £1 stg., and 10 dollars going further than the eagle: in like manner, the sterling shilling and six-pence being conventionally raised relatively to the crown and half-crown, and the American ¼ dollar and lower divisions being lowered relatively to the dollar and ½ dollar, it follows that the circulation of crowns, half-crowns, and the American ¼ dollars and lower coins will be materially retarded.

I remarked before that any attempt to reconcile the two currencies of Great Britain and the United States, would be hopeless: it only remains then to discard our Provincial notation and adopt one or other of these, with or without modifications. Two proposals have lately been made—that of Sir John Pakington, which was in effect, to coin for us sterling monies under our present current denominations, such as seven-pence half-pennies, one and three-pennies, and so on: this, stereotyping our present absurdities, may be rejected at once: the other, was the bill passed in the Provincial Legislature last year, and disallowed by the Home Government for ostensible reasons which need not here be discussed. This bill proposed simply that the £ sterling, as determined by the United States' mint at $4. 86⅔, should be as at present, denominated £1 4s. 4d. currency, and that of the £ currency thus defined, one-fourth part should be called a dollar, which should ever after be taken as the unit of monies, the dollar being divided into one hundred cents, and all monies and coins being determined by the proper proportion of their value to this value of the dollar. This proposal is undoubtedly simple, clear and concise, being a great step in the right direction: in fact, it would amount to adopting the American system in its entirety, both standard and notation. But, it may be remarked, in the first place, that an entirely new coinage would be required, as sterling money would no longer pass at the rates of American money, even conventionally as at present, and to this it is not likely the British mint will consent. Secondly, that the American notation should serve us both as an example and a warning; the inconvenience felt in the practical currency of the United States, arises from the circumstance of their having retained the old coins along with the new denominations, and not having insisted strongly enough on the division of the dollar into tenths or dimes. Thus the quarter dollar is not an exact number of dimes, and the York-shilling and the sixpence not even an exact number of cents; these coins ought to have been withdrawn altogether from circulation; the division should have run, not only in theory but in practice, 10 cents, 1 dime—10 dimes, 1 dollar, and no coin should fall between the cent and dime which is not an exact number of cents, nor any between the dime and dollar not an exact number of dimes. In fact, the people should have been made to count by tens upwards, instead of downwards, by halves, quarters, eighths, and sixteenths. This precaution was not taken in the bill in question, and if it had been, would still more strongly have necessitated the use of new coins: probably they would have been the dollar, the five-dime piece, or half-dollar, a two-dime piece, the dime, and the cent.

There is one remaining system to be examined, and to this I would beg to direct especial attention: it is the system proposed to be adopted for a decimal division of sterling, recommended by a commission of the best scientific men in the kingdom, and which will probably be carried out in a few years in its integrity, under the superintendence of the great Sir John Herschel. In this division the £ sterling will contain ten florins, the florin ten-pence, and the penny ten farthings, so that the currency will consist of the following coins:—The pound of ten florins, or the sovereign; the five-florin piece, or half-sovereign; a two-florin piece, and the florin itself. The only new coin here required is the double-florin, and this will probably be issued as soon as the withdrawal from circulation of the crown and half-crown, already begun, is completed.

The divisions of the florin will be the five-penny piece, which is the present shilling sterling, the two-penny piece, for which the dime might pass, and the penny; with the latter, some practical difficulty exists, for being equal to two-pence two-fifths of the present sterling, it would be too large for a copper coin, and too small for silver. Three methods have been suggested for obviating this difficulty—the first proposes to make a coin of a convenient size of a proper alloy of silver and copper; the second to have a copper coin with a central disk of silver; and the third to make the coin of silver, with a hole in the centre: any of the three methods would probably do.

For the divisions of the penny it would be sufficient to have the farthing and a five-farthing piece, or half-penny: the farthing being then the thousandth part of the pound, instead of one nine-hundred and-sixtieth as at present, and nearly the same as half a cent.

This system, then, is complete in all its parts, more useful than the federal money, because embracing a larger range, the pound being as much more useful than the dollar in large transactions as the farthing than the cent in small, and every coin being an exact multiple of the lower denomination.

In the adoption of this currency by Canada, there seems to be no difficulty in the way; all current sums would be turned at once into sterling at the current rate, and after the trouble of the first step, no fresh vexation would occur. There is little fear that the mint would object to it, and the Province would have the honor of outrunning the mother country in effecting perhaps the greatest commercial reformation that has been made in moderntim times.

The changes, which are here discussed with reference to money merely, apply with still greater force to the numerous weights and measures which are used both here and elsewhere. The anomalous and annoying divisions that occur in every department, have long been a theme for scientific indignation; but a reformation of these will perhaps only be brought about at long intervals. What was done in France at a single blow, will with us be the work of a longer but not less certain process: the guinea of 21s. has at last disappeared—the score of 25, and the dozen of 13, only linger in some rural corners; the cwt. of 112 lbs. is fast giving way before the legitimate claimant of that title, and the Bank of England has just taken one important step, which will be followed by many others, in announcing their intention to use hereafter only weights which are decimal multiples of the Troy grain.

These facts give us hope that some day or other our children's children may be saved the irksome labour that our childhood underwent, and an arithmetic book of the present day be regarded by them as a useless curiosity.

The Horse and its Rider.

BY J. BAILEY TURNER, ESQ., QUEBEC.

It is thought that wild horses existed in Europe, but that among the Celtic tribes the domesticated horse was not known until about the period that the Celtic-Scythian Gauls ascended the Danube and crossed the Rhine, and that it was introduced into England by the *Phœnicians, who were the means of bringing* many Eastern customs and commodities into the land with which they traded. Now we know that the Celtic tribes in France were horsemen, for Pausanius tells that they used in their armies the trimarkesec, or well-known trinal arrangement of a knight and his two squires, while in Britain, at the time of Cæsar's invasion, the natives fought in chariots; the Gallic Celts therefore followed more the custom of Northern Asia, and the British Celts that of Southern Asia.

It has been commonly believed and asserted, that astronomical observations were first made in Egypt, and that there the Zodiacal belt was divided into its twelve horses; but it has now been satisfactorily shown, that the zodiacal constellations were named in some country more northerly either than India or Egypt, therefore before the civilization of either, or the introduction of the domesticated horse; and that as in the houses of the sun, the horse is not placed, we may take that as an indication that that animal was already used as a type of the moving power of the sun, and as a personification of that luminary, by the nation to whom we may attribute the division of the zodiac; some riding nation of Central Asia. Among all the riding nations the horse, or the name of the horse, was used to express beauty, power and exaltation; and in the earliest annals of the Persians, the various names of that animal are not only titles of the sun, but of kings and great lords: as *Var*, in Varanes; *Phar*, in Pharnabasus; *Asp*, in Lorasp. The same practice prevailed among the Gothic nations, where we find Hengist, Horsa, Uppa, and Bayard, all names of the horse, applied to princes and chiefs. It is probable that superstitious veneration was first applied to the horse in Egypt, Arabia, and the neighbouring countries, at about the period of the first Scythic invasions; for we find that some of the tribes of idolaters by whom the Jews were surrounded in Palestine worshipped gods in the form of horses. The kings of Judah themselves were often polluted by this worship, for we read that the pious Josiah took away the horses that the kings of Judah had given to the sun, at the entering in of the house of the Lord. In Europe, a *black horse* was *long* considered a form of *the evil* one. Among many of the Pagan Asiatic tribes at this day, their magic ceremonies are performed with small images of horses; and the very Mahometans, to whom "the likeness of anything that is in heaven above, or in the earth beneath, or in the waters that are under the earth," is an abomination, admitted a kind of semi-idolatrous worship of the horses of two of the great heroes of Islam, Hosein and Khizr. Our own Teutonic ancestors sacrificed horses to the sun, Ertha, and other divinities, in their temples on the *Island of Rugen. All the sun-gods*, wherever worshipped, by whatever people, under whatever name, had studs of sacred horses, either to draw their idol chariot, or to be led in solemn procession before its shrine; such were those of the Persian *Ozmusd*, snow-white, and *bred for the service of the temple* in Cilicia. In every temple of the sun, in every sacred grove, from the Baltic to the Ganges, there were stalls for the holy horses. The horse has been everywhere the type of victory, the national emblem, the standard of battle—either by the exhibition of its skull, or its tail, or by the whole image of the animal. Who has not heard of the white horse embroidered on the banners of *our Saxon ancestors? To this day, once in each year, the whole* peasantry of the neighbourhood meet to clear the weeds and grass from the surface of *a huge white horse, extending* over more than an acre, cut deeply into the face of a chalk hill, near Letcombe Regis in Berkshire, supposed to have been so cut in commemoration of a great victory gained by Alfred the Great over the Danes, under Offa, in the year 871.

> "Carved rudely on the pendant sod is seen,
> The snow-white courser stretching o'er the green;
> The antique figure scan with curious eye,
> The glorious monument of victory.
> Then England reared her long dejected head,
> Then Alfred triumphed and invaders bled."

Other traditions, however, affirm that this singular antiquarian relic is of much older date than Alfred, and was intended to represent the white-horse of Hengist; to this day, the tail of a white horse, with the ends of the hair dyed red, and fixed to the end of a lance, is the standard of the Mahometan cavalry: it has replaced over all Islam the white banners of the Ommiades and the black ones of the Abassides.

The great object hitherto has been to ascertain the original habits of the horse in its wild state, the race of mankind by whom it was first subjugated to man's use, and its probable first introduction to what are commonly known as civilized countries. I shall now proceed to notice a few other facts with respect to this animal, as known to and used by the ancients, and trace its history to our own time. Proceeding to other countries in the neighbourhood of Egypt and Arabia, we learn from Herodotus that the Babylonians had vast numbers of horses. He speaks of a certain satrap, or lord, of their country, by name Tritantæchmes, as owning, in addition to his war horses, 800 stallions and 16,000 mares. The same author also notices the numerous cavalry of the Bactrians and Caspians, and tells us, that though the quadrupeds and birds of what is now British India far exceeded in size those of other countries, the horse was an exception, for it was far surpassed by a peculiar breed in Media named the Nisean. Ten horses of this breed, superbly caparisoned and of extraordinary size, drew the chariot containing the idol of Jupiter, in the train of Xerxes during his expedition into Europe. *At this day the* horse of Hindostan, of the native breeds, is a very inferior animal; and we learn from Col. Sykes, that the only firm, well-made horses in the country are the result of repeated crossing with the best blood of Arabia and Persia: and latterly the importation of English blood has done much to improve the race. Major Gwatkin, the Superintendent of the East India Company's breeding stud in Northern India, describes the original Indian mare, as very inferior in shape, and generally a jade with narrow chest, drooping mean quarters, and *if above fourteen and a half* hands high, much too leggy. Just such as Major Gwatkin describes them, are the sculptured horses wherever met with in India, showing that what the native horse is now, it has been from the earliest times. It does not appear that the Babylonians, any more than the Persians and Greeks, at or about the time of Homer, were accustomed to ride on horseback. All the heroes of the Iliad are depicted as fighting in chariots; and chariots alone are found sculptured on the basso-relievos of Persepolis. *Late discoveries in the ruins of ancient Nineveh lead us to suppose*, that the Medes were accustomed to ride on horseback at a much earlier period; for Mr. Rich speaks of a basso-relievo of a mounted warrior, and of the figure of a riding sportsman, catching a deer with a casting-net, found in the ruins of that city. As I before observed, saddle-horses do not appear to have been much used in South-Western Asia; for, on the authority of Herodotus, Cyrus opposed camels to the Lydian Cavalry of Crœsus. After this time it is probable that the Persian sovereigns availed themselves of the services of various equestrian tribes from the higher Asiatic regions, coming through the passes of the Western Caucasian range, along the coast of the Caspian; for from the time of Cyrus we find cavalry invariably mentioned as forming a part of the Aramean legions, and in various parts of Persia they are found in the sculptures of a later period. I before observed, that though by the express command of God, the Israelites were forbidden to use horses, Solomon broke the command, and imported both horses and chariots from Egypt. In the First Book of Kings, chapter x., verse 29, we have the record of exactly what he paid for them: reduced into English sterling, each horse cost about £17, and each chariot about £68. The trade was evidently carried on by the gross or string, as the price was not for different values of single horses: and from the same record we learn another important fact, that in Phœnicia horses were either dear or scarce, for Solomon, after supplying the armies of Israel, traded in horses with the Phœnicians. The Tyrians, another mercantile people of great renown, imported horses from Armenia, and carried them to their colonies in Africa, to Crete, Sicily, Spain, and Greece. Thus may have arisen the old Greek fable, that Neptune, the god of the sea, produced the horse by striking the earth with his trident. It was also the belief of the Circassians, that the Shalokh, the noblest of the Cabarder breeds, sprung from the sea; probably because in either case the parent stock was imported by water. There is another mythological curiosity about the horse As the camel was styled, by the camel-riding tribes of Arabia, the ship of the desert—so was the ship styled, by the Celto-Scythians, the horse of the sea. Hence, under the names of the horse and mare, were typified in the Druidical worship, the helic and lunar arkite enclosures, a worship and a mystery which would of themselves form the subject of a lecture; hence the Eastern mythological fables of Perseus and Bellerophon.

It was the opinion of Buffon, the great French naturalist, that Arabia had no horses in the early ages, nor even at the commencement of the Roman Empire, and hardly any at the date of the Mahometan Hegira. He supports this opinion by the fact, that 200 years after the Christian era, horses were sent as a present to the Arab princes; and that 400 years after, one of the Roman emperors sent 200 Cappadocian steeds to the same country; while in the 7th century, Mahomet had but two horses in his army, when he fought with the Koreish, and did not capture a single horse in his victorious campaign. But, admitting the truth of the first two facts, as stated by Buffon, the argument by no means holds good in the case of Mahomet. Mecca and Medina were in the midst of the Edomite Arabs, then, and to this day, for the most part a camel-riding tribe; but this by no means proves that the northern tribes, the Bedoueens and the clan of Yemen had no horses. The land of the Edomite Arabs has no pasturage whatever for horses, nor does it grow the golden barley, the food with which the Arab of Yemen delights to feed his favourite mare. On the authority of Laborde, the Edomite speaks with envy and admiration of the glorious chargers of his brethren the equestrian Arabs. Robber by profession, what could the Arab do without a horse? Long before the fall and destruction of Jerusalem by Titus, bands of Jews, stray remnants of the captivity of Sennacherib, of the tribes of Gad and Manasseh, had taken to the desert, and adopted Arab customs and means of subsistence; under a succession of their native princes, they exercised a nomade warfare, fought great battles, captured Mithridates, and utterly defeated a Persian army, entirely composed of horsemen. And, what after all was Abraham, the father of Isaac and Jacob and the patriarchs, but an Arab Sheik, an Arab of the Arabians? In revenge for this defeat, a fearful massacre took place among the Iranese Jews, and whole families of them, flying from the slaughter, took refuge in the tents of Yemen, where they became *Matnoub*, a term denoting the concession by the host to the guest to pitch the tent on *the same line*; and in return for the hospitality, some years after joining their sabres to those of their Arab hosts, they in one day prostrated the Parthian empire on the field of Kadesiah. That the Arabs had horses at the commencement of the Cæsarian Era we know from the work of Hirtius on the wars of Alexander; for he says expressly, that Cæsar sent to Malchus, that is Melek, for a reinforcement of cavalry; while a little later, but still before the time of Mahomet, we hear of a war between two tribes, that lasted forty years, on account of a horse-race. Better evidence still is found in ancient Arabian poems, once suspended in the Kaaba, all dating before the time of Mahomet, which in animated and glowing terms speak of the horse and its qualities, give splendid pictures of cavalry battles, and notices which prove that those who wrote them had derived from their ancestors a noble breed of horses. Nay, if with many of the commentators, we take the Book of Job to have been written before the time of Abraham, and that Job was an Arabian or Idumæan prince and prophet, what shall we say to his description of the horse and his rider, "Hast thou given the horse strength? Hast thou clothed his neck with thunder? Canst thou make him afraid as a grasshopper? The glory of his nostrils is terrible. He paweth in the valley and rejoiceth in his strength; he goeth on to meet the armed men. He mocketh at fear, and is not affrighted, neither turneth he back from the sword: the quiver rattleth against him, the glittering spear and the shield. He swalloweth the ground with fierceness and rage, neither believeth he that it is the sound of the trumpet. He saith among the trumpets, Ha, ha; and he smelleth the battle afar off; the thunder of the captains and the shouting." A passage probably one of the most sublime ever written, and which could have been written by no man not well acquainted with the character of the animal, particularly when employed in warfare. It is a valuable passage also, because it shows that the horse was known in Arabia before it was in Egypt, and was then used by riders in war, as we have seen that the horse was not known in Egypt in the time of Abraham. Again, as to Mahomet, however badly provided with horses he may have been at the outset of his career, we find that in repeated passages of the Koran, he inculcates on his followers the utmost respect for the useful qualities of the animal. In one remarkable passage these words occur: "Thou shalt be for man a source of happiness and wealth; thy back shall be a seat of honor and thy belly of riches; every grain of barley given to thee shall purchase indulgence to the sinner."

Let us also remember what the Arabians were, and what they afterwards became, when to their original love of adventure and disposition for conquest was added the fierce spirit engendered by religious enthusiasm; but no mere enthusiasm could have effected the transfer of simple herdsmen into the best, the most daring cavalry of their time, or indeed of any time; have enabled them to destroy the vast mounted armies of the Persians, or encounter on equal terms, on many a field, the scientific discipline of the eastern empire, and in little more than 100 years after the prophet's death, given wings to the sword of Islam, and carried its green standard from Arabia to India in one direction, and France in another. In the year 631 Mahomet died: 366 years after, so great was the increase of his followers, that we find the horsemen of Islam numbered by the hundred thousand. When Mahmoud, the Gazneride Sultan, the conqueror who carried away the sandal-wood gates of the temple of Somnauth, at Guzerat in Hindostan, and placed them at Cabool; whence they were borne back in triumph by an Anglo-Indian army, in the memory of every one who listens to me; when this Mahmoud was about starting on one of his twelve expeditions to India, he demanded of Ismael, a tributary Seljukian chief, who dwelt in the territory of Bokhara, "How many men he could furnish for military service?" "If you send," replied Ismael, "one of these arrows into our camp, fifty thousand of your servants will mount on horseback." "And if that number," continued Mahmoud, "be not sufficient?" "Send this second arrow to the horde of Balik, and you will find fifty thousand more." "But," said the Gaznevide monarch, "If I should stand in need of the whole force of your kindred tribes?" "Despatch my bow," was the last reply of Ismael, "and as it is circulated around, the summons will be obeyed by two hundred thousand horsemen." Such was the progress made by this race, in numbers and power, that after the overthrow of the Gaznevide dynasty by the Seljukian Turcomans, we find them, in the year 1050, attacking the Roman Empire in the East. Gibbon says, that the Empire was assaulted by an unknown race of barbarians, who united the Scythian valour with the fanaticism of new proselytes, and the arts and riches of a powerful monarchy. The myriads of Turkish horse overspread a frontier of six hundred miles from Tauris to Arzeroum, and the blood of 130,000 Christians was a grateful sacrifice to the Arabian Prophet. Only about 250 years before this, in the year 721, the Riding nations, the followers of the false prophet of Mecca, had possessed themselves of the whole southern shore of the Mediterranean, from Palestine to the pillars of Hercules; had crossed over into and conquered almost the whole of the Spanish Peninsula, and advanced into France so far as Tours, when in one of the decisive battles of the world, the conflict of Tours, the Mahometans were utterly routed by Charles Martel. The fight lasted for seven days, and the contemporaneous historians declare that 350,000 of the Mahometan invaders perished on the field, under the iron maces of the gigantic Teutons, brought by Martel from beyond the Rhine to aid the Frankish Monarch. From the Hegira, almost to this day, this restless race of horsemen has troubled the Christian world, whether under the name of Arab, Moor, Turk, Turcoman or Ottoman, the last bloody repulse having been given to them by John Sobieski under the walls of Vienna in 1663. As we shall see hereafter, the history of this race is most intimately connected with that of the horse—Arabia being the country in which that animal, until very modern times, has attained the highest standard of excellence. With respect to this nation of horsemen—the Saracens and their successors, the Turks and the Ottomans—there are some most extraordinary prophecies in the Revelations of St. John; and so perfectly borne out by the event, that it may not be out of place to notice them. The words of the prophecy are these:—"And there came out of the smoke locusts upon the earth—and unto them was given power, as the scorpions of the earth have power—and it was commanded them that they should not hurt the grass of the earth, neither any green thing—neither any tree—but only those men who have not the seal of God in their foreheads—and to them it was given that they should not kill them, but that they should be tormented five months." A verse or two after, the sacred writer continues:—"And the shapes of the locusts were like horses prepared unto battle, and on their heads were as it were crowns like gold—and their faces were as the faces of men—and they had hair as the hair of women—and their teeth were as the teeth of lions—and they had breast-plates, as it were breast-plates of iron—and the sound of their wings was as the sound of chariots of many horses running to battle." "One woe is past, and behold there come two more woes hereafter." And then we have the further description: "And the number of the army of the horsemen were two hundred thousand—and I heard the number of them—and thus I saw the horses in the vision, and them that sat on them—having breast-plates of fire, and of jacinth and brimstone—and the heads of the horses were as the heads of lions, and out of their mouths issued fire and smoke and brimstone—by these three was the third part of men killed by the fire, and by the smoke, and by the brimstone which issued out of their mouths."

The locusts spoken of in the introductory verse allude, without doubt, to the clouds of Saracen horsemen which, like those insects in number and in the ravages which they made, overspread the whole boundary of the Roman Empire in the East for upwards of 150 years. The prophecy with respect to the green grass, the green things and trees, that no one should do them any injury, was most remarkably verified; for the Caliph, Hassan Abubeker, the successor of Mahomet, when his army was about to start on the Persian campaign, issued an order to his army in these words:—"*Destroy no palm trees, nor burn any fields of* corn; cut down no fruit trees, nor do any mischief to cattle, only such as you kill to eat." The order concludes:—"You will find another sort of people that belong to the synagogue of Satan, who have shaven crowns, be sure you cleave their skulls." The Bedawee followers of the prophets especially detested monks. The five months during which this torment was to last, may be explained in two different ways—five prophetic months are exexactly 151 years, or it may mean the five months of each summer, during which the supply of forage in the field enabled large armies of cavalry to be kept in motion. The crowns like gold, may refer to the superb jewelled turbans, invariably worn by the Saracen warriors; their faces are described as being like the faces of men—that is, fierce and bearded, while their long hair was carefully preserved, and plaited like the hair of women. Their breast-plates were like breast-plates of iron—an evident allusion to the shirts of bright steel mail universally worn by the Saracen and Turkish cavalry, to be seen to this day on the persons of the Circassian and other Eastern horsemen. The sound of their wings as the sound of many chariots, is a most poetic and graphic description of the noise which accompanies the rapid advance of a large body of cavalry. The vast numbers of the Saracen and Turkish hordes is expressed by the indefinite expression, "two hundred thousand thousand." Scarlet, blue and yellow, fire, jacinth and brimstone, have ever been the favourite colours of the sons of Islam. The fire, smoke, and brimstone which issued out of their mouths, by which the third part of men were slain, may, and doubtless does, allude to the fire-arms, their coming into general use, and which the Ottoman Turks constructed of unusual size.

(To be continued.)

Observations on the Leafing and Flowering of Plants.

It is exceedingly desirable that a system of observations should be established throughout Canada, similar to those which are now being carried on with such curious results in the neighbouring States, having for their object the leafing and flowering of plants. The Canadian Institute would be glad to receive from any of their members or others, any assistance in the shape of observations that they may be able to afford; the more numerous the observers, the better results may be expected, as it is only by comparing several observations from different places, that errors and variations arising from locality may be eliminated. In order to assist those who may be willing to commence such observations, the following list of native and naturalized plants has been prepared, containing principally those which are to be found in the neighbourhood of Toronto, and only those which are sufficiently common to be readily observed. The times of flowering have been added, as far as known to the writer, they may of course vary slightly. The list is by no means a complete one, many common plants, especially of the compositæ and umbelliferæ, being omitted.

In observations on plants grown in gardens, it is necessary to exclude all annuals, as their periods of leafing and flowering vary so much, that no conclusions could be drawn from them, unless the portions of the same seed were sown on the same day. No *plants which have* been protected in any way, are available for these experiments, nor are those which exist in many varieties.

For the foliation, it is best to observe when the first leaves burst the bud, and when the upper surface first becomes exposed to the light.

For flowering, it is advisable to take the moment when the anthers become visible, and for the fructification, the dehiscence of the pericarp, or in cases of indehiscent fruits, the evident arrival of the seed carpel at maturity, may be taken as the dates to be noticed.

It would also be well to observe the period of defoliation, that is when most of the leaves have fallen.

Another subject, deserving of attention, is the periods at which early and late frosts occur, of sufficient intensity to effect any material injury to plants or vegetables; such, for instance, as the Dahlia and the Tomato, which are, perhaps, of all, the most sensitive to the influence of cold.

In connection with this subject, it would be of considerable interest to make observations on the arrival and departure of the various summer birds, insects, reptiles and animals.

PLANTS TO BE OBSERVED AS TO THEIR TIME OF LEAFING.

		flowers in
Acer Saccharinum	Sugar Maple	April.
Acer Rubrum	Red Maple	March.
Œsculus Hippocastanum	Horse Chesnut	June
Juglans Cinerea	Butternut	May.
Betula Papyracea	Birch	April.
Juglans Regia	Black Walnut	May.
Carya Alba	Shell-bark Hickory	"
Carya Amara	Bitter Hickory	"
Liriodendron Tulipifera	Tulip Tree	June.
Ulmus Americana	White Elm	April.
Fagus Ferruginea	Beech	May.
Corylus Americana	Wild Hazel	April.
Carpinus Americana	Iron Wood	"
Pinus Pendula	Larch	
Fraxinus Americana	White Ash	April.
" Sambricifolia	Black Ash	"
Rhus Typhina	Sumach	June.
Populus	Poplar	
Quercus	Oak	
Salix	Willow	
Sambucus Canadensis	Elder	June.

Among plants usually cultivated in gardens, the following may be observed as to their time of foliation:—

Mezereon.	Quince.
Double-flowering Almond.	Peach.
Lilac.	Double-flowering Peach.
Gooseberry.	Ailanthus.
Black Currant.	Abile.
Red Currant.	Honeysuckle.
Raspberry.	Linden.
Apple.	Mountain Ash.
Pear.	Spiræa.
Plum.	

WILD PLANTS TO BE OBSERVED AS TO THEIR TIME OF FLOWERING.

Ranunculus Bulbosus	*Buttercup*	May.
" Acris	Tall Crowfoot	June.
" Aquatilis	White Water Crowfoot	June.
Trifolium Pratense	Red Clover	
" Repens	White Clover	
Fragaria Virginiana	Strawberry	
Cnicus Arvensis	Canada Thistle	
Erythronium Americanum	Dog-tooth Violet	
Dirca Palustris	Wickaby	
Rubus Odoratus	Dog Rose	
" Occidentale	Black Raspberry	
Prunus Virginiana	Black Cherry	
" Borealis	Red "	
Cratœgus Coccinea	Thorn	
Ribes Floridum.		
Ribes Cynorbati.		
Trillium Pictum	White Death Flower	
Leontodon Taraxacum	Dandylion	
Lillium Canadensis	Orange Lily	
Arum Atropurpureum.		
Anemone Nemorosa	Wind Flower	April.
" Virginiana	Tall Anemone	June.
Hepatica Triloba	Three-lobed Liverleaf	March.
" Acutiloba	Sharp-lobed "	"
Thalictrum Divicum	Early Meadow Rue	April.
Caltha Palustris	March Marigold	"
Coptis Trifolia	Gold Thread	May.
Aquilegia Canadensis	Columbine	"
Actœa Alba	White Baneberry	"
Podophyllum Peltatum	May Apple	May.
Nymphæa Odorata	White Waterlily	July.
Nuphar Luteum	Yellow "	"
Sarracenia Purpurea	Pitcher Plant	June.
Sanguinaria Canadensis	Blood Root	April.
Nasturtium Palustris	Marsh Cress	June.
Dentaria Diphylla	Toothwort	May.
Capsella Bursa Pastoris	Shepherd's Purse	April.
Viola Pubescens	Yellow Violet	June.
Parnassia Palustris	Grass of Parnassus	July.
Hypericum Perforatum	St. John's Wort	June.
Elodea Virginica	Marsh "	July.
Silene Noctiflora	Night Flowering Catchfly	June.
Stellaria Media	Chickweed	April.
Portulacca Oleracea	Parslane	July.
Claytonia Virginica	Spring Beauty	April.
Impatiens Fulva	Touch me Not	June.
Rhus Toricodendon	Poison Ivy	June.
Ampelopsis Quinquefolia	Virginia Creeper	July.
Polygala Pauciflora	Milkwort	May.
Supinus Perennis	Supine	
Comarum Palustre	Marsh Cinque-Foil	June.
Potentilla Anserina	Silver Weed	April.
Amelanchier Canadensis	Shad Bush	April.
Epilobium Coloratum	Purple-veined willow herb	July.
Œnothera Biennis	Evening Primrose	June.
Mitella Diphylla	Mitre Wort	May.
Fiarella Cordifolia	False Mitre Wort	April.
Aralia Nudicaulis	Sarsaparilla	May.
Cornus Canadensis	Dwarf Cornel	May.
Linnæa Borealis	Twin Flower	June.
Diervilla Trifida	Bush Honeysuckle	June.

Mitchella Repens	Partridge Berry.	
Astir(?)		
Solidago(?)	Golden Rod.	
Gnaphalium(?)	Cudweed.	
Lobelia Syphilitica	Great Lobelia.	
" Inflata	Indian Tobacco.	
" Kalmii.		
Gaultheria Procumbens	Winter Green	May.
Epigœa Repens	Trailing Arbutus	April.
Pyrola Rotundifolia	Round Leaved Pyrola	July.
" Secunda	One Sided Pyrola	July.
Chimaphila Umbellata	Prince's Pine	June.
Tricutalis Americana	Starflower	May.
Lysimachia Ciliata	Loosestrife.	
Utricularia Vulgaris	Bladder Wort	June.
Verbascum Thapsus	Mullen	June.
Mimulus Ringens	Purple Monkey Flour	August.
Veronica Beccabunza		June.
" Peregrina		April.
Gerardia Guercifolia	False Fox Glove	August.
Castilleja Coccinea	Scarlet Painted Cup	May.
Pedicularis Canadensis	Louse Wort	May.
Verbena Hastata	Blue Vervain	July.
Mentha Canadensis	Wild Mint	July.
Scultettaria Galericulata	Skullcap	August.
" Paroula	Small do.	May.
Lithospermum Canesceus	Hoary Puccoon	May.
Datura Stramonium	Thorn Apple	July.
Gentiana Ptheumonanni	Marsh Gentian	August.
Menyanthes Trifoliata	Buckbean	August.
Asclepias Cornuti	Milkweed	July.
Phytolacca Decanda	Pope Weed	July.
Shepherdia Canadensis	Buckthorn	May.
Symplocarpus Fœtidus	Skunk Cabbage	April.
Alisma Plantago	Water Plaintain	July.
Sagittaria Variabilis	Arrow Head	"
Vallisneria Spiralis		August.
Cypropedium Spectabile	Lady's Slipper	July.
Smilacina Bifolia	Two-leaved Solomon's Seal	May.
"	Great Solomon's Seal	May.
Clintonia Borealis		June.
Noulaiia Perfoliata	Bell Wort	May.

CORRESPONDENCE.

Reply of the Provincial Secretary on the part of His Excellency the Governor General to the Memorial of the Canadian Institute, for the continuance of the Magnetical Observatory at Toronto under Provincial management:

SECRETARY'S OFFICE,
QUEBEC, 23rd February, 1853.

SIR,—I am commanded by the Governor General to acknowledge the receipt of the Memorial of certain of the members of the Canadian Institute, praying that steps might be taken to ensure the continuance by the Provincial authorities of the Observatory, heretofore conducted at the expense of the Imperial Government, after the proposed withdrawal from Toronto of the Military Detachment connected with that establishment.

I am directed by His Excellency to acquaint you, and through you the Canadian Institute, that the subject referred to in their Memorial has for some time past engaged His Excellency's most anxious consideration, and that His Excellency has already taken the necessary measures to prevent, if possible, the proposed dismantling of the Observatory by the Imperial authorities at the end of next month.

Should the measures above indicated be, as His Excellency trusts, successful, it will then become necessary to consider upon what basis, and for what objects, &c., it is desirable to carry on the Observatory as a Provincial establishment.

The remarks upon these heads contained in the Memorial of the Institute will not fail to receive the attention they deserve when this branch of the question shall require to be considered.

I have the honour to be, Sir,
Your obedient servant,
A. N. MORIN,
Secretary.

Captain Lefroy, R.A., F.R.S.,
President of the Canadian Institute.

Letters Patent of Invention,

Issued from the Bureau of Agriculture, up to the 18th of February, 1853.

George Stacy, of Montreal, for an "*Improved Spike Machine.*" (Dated, 20th January, 1853.)

William Allchen, of the Village of Paris, for an "Improved Scythe Holder." (Dated, 26th January, 1853.)

George Ansley, of the Village of Vienna, for "The Centrifugal and Centripetal Churn." (*Dated, 8th February, 1853.*)

Ezekiel Burley, of the Township of Clarke, for an "Improvement on the Wooden Plough." (Dated, 14th February, 1853.)

INCORPORATED BY ROYAL CHARTER.

Canadian Institute.

Tenth Ordinary Meeting, 19th February.

The Council announced the reception of a letter from the Secretary of the Court of Directors of the Hon. East India Company, informing the Institute that it having been represented to the Court by Capt. J. H. Lefroy, R. A., President of the Canadian Institute, that the possession of certain Meteorological and Magnetical Observations made in India, would be of value in this Colony, seven volumes of Magnetical and Meteorological Observations, taken at Madras, Bombay, Singapore and Dodabetta, have been forwarded to the Institute.

The following gentlemen, having been duly proposed and ballotted for at the last meeting, were elected members of the Institute:—

G. H. Sootheran........................Toronto.
Andrew Drummond........................ "
J. T. Brondgeest........................ "
James Wright, Junior Member........................ "
Hon. Peter McGill........................Montreal.
George D. Gibb, M.D........................ "

A paper on the "Valley of the Nottawasaga," was read by Mr. Fleming, C. E.

Eleventh Ordinary Meeting, 26th February.

The following gentlemen were duly elected members of the Institute:

C. E. Hancock........................Toronto.
F. F. Carruthers........................ "
Henry Fowler........................ "
William Pyper........................ "

Announcement was then made of the following donations to the Institute:

The Tower Menagerie, with numerous wood cuts and illustrations, after Harvey.

The Sylvia Britannica; or Portraits of Forest Trees.

Map of the Hemispheres—Physical Map of France, Paris, and detached parts of France and Canada—By A. H. Armour.

Two volumes of British Colonial Magnetical and Meteorological Observations. Vol. 1.—St. Helena. Vol. 2.—Van Dieman's Land.—By Capt. J. H. Lefroy, R. A.

Mr. G. W. Allan read a paper "On the Birds wintering in the neighbourhood of Toronto."

Twelfth Ordinary Meeting, 5th March.

A letter was read from F. Cumberland, Esq., accompanied by a donation of eight-and-twenty volumes of Reports of Committees of the House of Commons; also a letter from the Provincial Secretary, in reply to the Memorial of the Canadian Institute, on the continuation under Provincial management of the Magnetical Observatory at Toronto.

The Rev. J. McCaul, LL. D., President of the University of Toronto, read a paper on "The Genuineness of some of the Classical Authors."

Thirteenth Ordinary Meeting, 12th March.

The undermentioned gentlemen being candidates for admission as members, were ballotted for and duly elected:

The Hon. and Right Rev. the Lord Bishop of Toronto.
J. G. Hodgins........................Toronto.
Henry O. H. George........................Whitchurch.
S. E. Campbell........................St. Hilaire.
O. Mowat........................Toronto.
A. K. Boomer........................ "

Dr. Bovell delivered a discourse on "The Forces which move the Circulation," illustrated by microscopical exhibitions of the circulation of the blood in the web of the frog's foot.

Fourteenth Ordinary Meeting, 19th March.

The following gentlemen were proposed as members of the Institute:—

R. P. Lelande........................Toronto.
W. Kingston Fisher........................Artemesia.
— McMicken........................Toronto.
J. Mitchell........................ "
Angus Morrison........................ "

A donation from Capt. Lefroy, R. A., was announced, consisting of—

Eight volumes of Papers on subjects connected with the duties of the Corps of Royal Engineers;

Brande's Manual of Chemistry, two volumes;

Synopsis of the United States Exploring Expedition;

The following gentlemen were duly elected members of the Institute:—

James Small, M. A. ....Toronto.
E. A. Walker........................Barrie.
J. H. Esten, Hugh Torney, } Junior Members........................Toronto.

Professor Buckland read a Paper on Ornamental Planting.

It was announced by the President that the Annual Conversazione would take place in the Hall of the Legislative Assembly, on Saturday, April 2nd, instead of Saturday, March 26th, as heretofore proposed.

The Earthquake Shock of 13th March, 1853.

Earthquake shocks, although not unknown in Upper Canada, are of sufficiently rare occurence to show an unusual range, or an unusual direction, in the movement of the earth's crust which occasions them, when they are perceived in this neighbourhood. The recollection is still preserved of a pretty strong shock that was felt at Niagara in 1801 or 1802*, and it is the first conclusion of Robert Mallet, from his elaborate examination into the facts of Earthquake phenomena, (Reports British Assoc., 1850,) that "Earthquakes occur over all parts of the earth's surface, both on land, and under the water;" he even goes further, and affirms that there is, at present, no sufficient ground for asserting that one region of the globe is permanently subject to them more than another. The great Lisbon Earthquake of November, 1755, furnishes however the only example which we find in his list, of a shock reported from the lake districts of Canada. They are more common in Lower Canada. Many of our readers will remember a shock which occasioned considerable alarm, and even some damage to buildings, at Nicolet, and on the shores of Lake St. Peter, on the 18th January, 1843, There was another at Montreal and its vicinity in April, 1843. Shocks were observed at Rochester, N. Y., September 19, and October 22, 1844. (R. R.) On November 2, 1850, a little before midnight, a shock, accompanied by a rumbling noise, was perceived at Fredericton, N. B. These instances, which are not given as a complete list, shew that we are less removed from the region of this phenomenon than is commonly supposed by

* Authority—The Hon. Wm. Allan.

Canadians. The shock of the 13th March, which has been generally noticed by the press as felt in the Niagara District, was also perceived at Toronto. "About half-past 5 o'clock, A. M.," writes one observer, "I was startled by a strange rumbling noise: it produced the usual effects of thunder that is near, namely a trembling of the house and bed, and a shaking of the windows; the first impression made upon me was that it was thunder, but I could not help feeling at the time that there was something strange and unusual in the effect produced, and the second impression was that it closely resembled what I had frequently read of earthquakes." A second observer, residing in a different part of the city, and writing quite independently, uses very similar language, but places the time earlier. "About ten minutes before five o'clock, by my watch, I was awakened out of a sound sleep by a rumbling noise, which I distinctly heard for some seconds after I awoke. Mrs. —— who was awake previous to the shock, not only heard the rumbling, but felt the bed vibrate to and fro."

The barometer was falling a little at the time of this occurrence, but its depression was only —.085 at 2 P. M., and at the next observation it had risen; the thermometer was above the mean, a very marked depression of temperature however followed it, giving the lowest of the month, —0.° 2 Fahr., on the night of the 14th instant. A state of magnetic disturbance, of considerable activity, moderate in respect to the amount of the changes, prevailed throughout the 12th.; but the photographic instruments at the Observatory shewed that no particular change of declination accompanied the movement itself. A westerly movement of 6 sec., occurred from 5h. to 5h. 15m.; but for the previous and the following half hours there was no change worth mentioning. The same same remark applies to the horizontal force.

REVIEWS.

1. *Ship Canal from Albany to New Baltimore. Reports and Estimates by W. J. McAlpine, Chief Engineer, and O. Blanc, J. Colman, and W. Perkins, Resident Engineers. Albany,* 1853.

The title which has been given to the Ship Canal projected in the above Report, is scarcely an index to its *purpose.* Some of our readers will enquire—"Where is New Baltimore?" and we confess we were somewhat startled in not ourselves being able to remember any city of that name, whose importance seemed to justify so great a work as a Ship Canal. New Baltimore is a town of no very great pretensions, on the west bank of the Hudson River, twelve miles below Albany, and in this distance is comprised the main difficulties embarrassing the navigation of that river between New York and Albany. From the former city to New Baltimore, the depth of water suffices for vessels drawing twenty feet; but above, and from thence to Albany, obstacles exist confining the draught of water to eight feet, as the maximum for vessels trading between that city and Tidewater. Time was when this draught of water would have been thought sufficient—nay, we have seen that it has hitherto accommodated that mighty western trade which has choked the Erie Canal, given birth and sustenance to its railway competitors, built up Buffalo, Rochester and Albany, and made New York what it is; not, indeed, that our enterprising neighbours have been content with the natural facilities afforded them, for the obstructions to the navigation of the upper portion of the river, attracted public attention at an early period after the Revolution, and the State of New York having made the first appropriation in 1797, continued a system of improvements in jetties, wing-dams, &c., until 1818, when the public expenditure had reached to very nearly 160,000 dollars.

Up to this period, the improvement of the river seems to have been confided to certain Commissioners, who had considered *three systems:* 1st. By the erection of piers or dams; 2nd. by projecting dikes or jetties, as adopted by Colborne on the Clyde; and 3rd, by the construction of an independent canal. Of these, the second proposition was adopted, and is said not only to have signally failed in deepening the river, but to have exercised a baneful influence in the formation of many of the recent obstructions to the navigation.

In 1819, a new Commission accordingly was appointed, and under its auspices the first hydrographic survey of the river was made during that year.

This resulted in a renewal of the canal proposition which, although at the time well received, was not adopted, and the whole matter rested till the Spring of 1831. In the interim, the jurisdiction of the Hudson had passed from the hands of the State to the Federal Government, and in 1832 a second hydrographical survey was made, resulting in further reports and suggestions for improvements. At last, and in 1834, Congress made another appropriation, but before its expenditure the whole subject was again referred to a "Board of Engineers," especially instructed to review two projects—one a canal, and the other for deepening the bed of the river—and, of these, the *Board* recommended the adoption of the latter.

Upon this, Congress voted further appropriations—namely, in 1836 $100,000; in 1837, $100,000; in 1838, $100,000; but in the latter year all further operations were suspended, and no additional appropriation has since been made.

But the tides of trade, like those of the waters, wait for no man. Since the year of the last appropriation, and that on which the improving operations were suspended, although acknowledged to be incomplete, the tonnage to and from Tide Water by the Erie and Champlain Canals *has increased* 1,983,066 tons, being now 2,766,349 tons.

This has hitherto been carried on the Hudson by vessels ranging (with the exception of steamboats) from 30 to 340 tons burthen, drawing from four to a maximum of eight feet nine inches. Of all the vessels enrolled at the Custom House at Albany in 1852, the "E. Corning," a barge, was the largest; *having length, 144½ ft.; breadth, 29½ ft;* depth, 8¾ ft.; and tonnage, 344.50.

It appears that the average cost of a trip from Albany to New York and return, is, for a canal boat of 90 tons, $90, and for a barge of 200 tons, $128; that the trade averages "three tons down to one up" freight, shewing a cost of movement of 75 cents per ton in a 90 ton boat, and 48 cents per ton in a 200 ton barge. Taking this as the basis, it is estimated that if the depth of the water allowed the passage of vessels of 1000 tons, the cost for movement in a 500 ton vessel would be reduced to 30 cents per ton, and in 1000 ton vessels to 18¾ cents per ton.

Again, in consequence of insufficient depth of water in the river, vessels now employed on it seldom go beyond the City of New York, and the trade even between Albany and Boston, Providence, Baltimore, &c., is subject to transhipment at that city, which, under the most favourable circumstances, costs 20 cents, or, if taken into store and then reshipped, one dollar per ton. This transhipment of flour results in a depreciation to from 1½ to 2 per cent., and wheat and other grain are also subject to considerable waste.

All these objections are urged as sufficient justification for the construction of a Ship Canal of 12½ miles in length, and capable of passing vessels drawing from 15 to 20 feet of water.

The dimensions of the proposed Canal are as follows:—Width at bottom, 50 feet; at water line, 120 feet; and 20 feet depth of water.

At Albany the Canal Basin will communicate with the river by two ocks combined, each 10 feet lift, 215 feet long, and 30 feet wide; and at New Baltimore by two locks combined, each 10 feet lift, 300 feet long, and 50 feet wide.

With reference to the expenditure of water, the loss by evaporation is assumed at ¼ inch per day, (it is said to range during the dry season from ⅛ to ¼ of an inch per day) which, over a length of 12½ miles of 120 feet wide, would give a loss of 240 cubic feet per minute.

The estimate for the loss by filtration, has been based on that of the old Erie Canal, (24 feet wide at bottom, 4 feet depth of water, and side slopes, each 8.944 feet long,) which, after investigation, is assumed at 50 cubic feet per mile per minute, giving for the Ship Canal a loss of 5,087 cubic feet per minute for the 12½ miles.

For the lockage, 10,000 tons per day is the freight assumed to be passed, requiring 5,887 cubic feet per minute.

These items, together with leakage at waste weirs and locks, give a total consumption of 16,000 cubic feet per minute.

To supply this seems to be the most complicated point of the scheme, and the more especially, because it is proposed to elevate the Ship Canal so that its surface of water will be 20 feet above the surface of the river at extreme low water mark. This will make it necessary (in pumping) to elevate the water on an average of say 18 feet.

This recommendation is made with a view of avoiding the expense of excavating below the level of the water in the river, and to the protection of the works against the influence of freshets, so destructive to property in the locality.

It seems that in some freshets the rise of water in the river in front of Albany has been as much as 18 feet above low water mark; and it is contended that if the river levels were adopted, the banks would be subject to overflow, the canal be liable to filling up, and endless expense result in keeping the bottom dredged out. In consequence of this periodical rising of the waters, many important branches of manufactures for which the position of Albany would afford great inducements, cannot now be advantageously established there; for no business, subjected to active competition, will bear either land carriage to any point in the vicinity above these influences, or the elevation of the factories, and the consequent expense of lifting and lowering the raw material and manufactured article through the necessary space.

It is argued therefore that in addition to the other advantages, the high water level of the Canal Basin will yield an opportunity for the pursuit of many manufactures before prohibited.

Two modes of water supply are suggested,—one of elevating the water from the river by steam power, the other by building reservoirs on streams in proximity with the Canal, and thus saving during floods and the suspension of navigation, a sufficient amount of water for service during navigation.

The natural flow of the streams during the dry season is estimated at 2,000 cubic feet per minute, leaving 14,000 cubic feet per minute to be provided for two months,—12,000 during two months,—and 5,000 during two months,—the difference being due to the increased yield of the rivers during those periods of the season.

The estimated annual cost of this supply (including interest on cost of Engines and Pumps—$90,000) is $42,600.

The second plan would involve the construction of six reservoirs on the Normanskill river, the estimate for which is $128,000: and the annual expense of working (inclusive of interest) $35,967, shewing an excess of the cost of steam of $6,633 over reservoir supply. The Engineers have prudently refrained from recommending either system as superior, satisfying themselves by the adoption of the highest estimate.

The total cost of the Canal, including supply of water, land damages, and Engineering, is estimated at $2,450,000, which at 7 per cent. and adding annual current expenses of working and repairs, would represent an annual cost of $246,500, or the amount which should be derived from the Canal to make the investment remunerative.

The estimate of revenue is based—1st. on the rental or sale of the land (we fear a very questionable source) to the amount of $12,000 per annum, leaving $131,000 to be derived from tolls. The present rate of tolls on the New York State Canals is four mills per 1000 pounds per mile: this on the ship canal would amount to 10 4-10ths cents per ton. Assuming 10 cents per ton as the toll to be levied, an annual aggregate trade of 1,315,000 tons would be necessary to make the investment pay as above. *This is less than half the tonnage of last year moving between the Erie and Champlain Canals and tide water* and as the continual growth of the trade may seem to be relied on, instead of 2¾ millions of tons as in 1852, the progressive increase would yield in 1856 4 millions, and in 1860, 6 millions of tons.

Relying on the advantages of making Albany the shipping port, whereby the cost of carriage (as in small bottoms) would be reduced, and that of transhipment with its depreciating results avoided,—and arguing that in consequence of their form ocean sailing vessels may be towed at a cheaper rate (proportionably to their tonnage) than canal boats, the projectors of this Canal depend, fairly enough, upon securing the larger share of the trade.

We are not inclined to an adverse judgment upon a scheme so enterprising, propounded in a report so skillfully and judiciously drawn as is this—but the course of trade does not always yield to the Engineer, charm he never so wisely—there are other influences beyond his controul (as the combination of established interests and capital) which may offer insuperable difficulties to the diversion of so large an item in ocean traffic and the profits connected with the carrying trade, as that for which Albany would now compete with New York.

It may be said, with much plausibility and some truth, that with this canal ocean vessels may freight as well at Albany as at the mouth of the river, but is there no risk of loss of time and demurrage?

A vessel entering inwards at New York, brings a general cargo to be distributed through the length and breadth of the Union, —unloads, ships her outward freight, and is off again.

Run her up to Albany to ship her outward freight,—and if thereby she loses one trip in the year, she forfeits more than the profits made out of the river transit. We write diffidently, for we are not entirely at home on matters strictly commercial; yet what is it that justifies the authors of this Report in saying that "the Hudson is the natural channel of the trade of Canada West," but that they mistake the course of trade for the path of nature? It is certainly no want of facile communication with the ocean which forces the trade of Canada West to the Hudson and New York, but precisely those attractive influences of capital and combination which, as they overcome in a great degree the advantages of our noble St. Lawrence and scarcely less noble canals, may hereafter offer an obstacle to the use of that at Albany, implying as it does the withdrawal of a profitable trade from New York.

We deny that the Hudson is the natural outlet for our trade; and as large sums of money have been expended in the improvement of the St. Lawrence, we may be pardoned for hoping that it may soon cease to be the artificial one; and that when Albany shall have intercepted New York for the ocean freights from the westward, our canals shall have claimed their own in the same service. Happily there promises to be enough for us all; and, therefore, eschewing any sectional jealousies, but without making any effort at generosity, we wish this scheme, so ably propounded, the highest success which its promoters anticipate. One matter, however, in connection with its construction, would seem to demand comment before we close. We perceive that the lockage is confined to two locks at the north and south ends, all of equal lifts, namely, 10 feet. We are not aware of the fall of the Hudson River between Albany and New Baltimore, but its velocity would lead us to conjecture that it must be considerable, and that provision must necessarily be made for it. It is apparent that unless the river line at both places be coincident, or the fall of the canal be made equal to the fall of the river, (neither of which is probable) the lift of the locks at New Baltimore should be greater than those at Albany, o intermediae lockage be inserted.

Ontario, Simcoe and Huron Railroad.—Report by the Chief Engineer. Hugh Scobie, Toronto, 1853.

This is a straight-forward, business-like document, much more to our fancy than the grandiloquent effusions it is sometimes our misfortune to see issued in connection with engineering projects. We think Mr. Cumberland has exercised a wise discretion in giving so simple a statement of facts, and so plain an exposition of his views in connection with the enterprize with which he is charged: for, undoubtedly, it was originated by persons not honoured with a very large share of public confidence; and that which, on the part of some, was at first a justifiable suspicion, seemed ultimately to strengthen into a blind prejudice and opposition, outliving the causes which induced them. Such a Report, therefore, as that before us, (even apart from its strictly engineering, statistical and commercial features) is well timed, for it puts the public in possession of the present condition and management of the work, and satisfactorily proves that if its earlier controul and government were inefficient, the main objections have been removed, and an independent and vigilant supervision secured for the future.

In connection with these points, we observe that under the instructions of the Railway Commissioners, Mr. Cumberland, in conjunction with Mr. Keefer, recommended "some alterations, tending principally to the reduction of curvature, and the more substantial and permanent character of the structures;" that on his assuming the charge of the works, and prior to the granting of Government aid, the original contract was set aside and a new agreement entered into between the Company and the Contractors, whereby "the entire completion of every anticipated requirement, including harbours, depôt service, and full equipment of rolling stock, has been secured on equitable terms,"—and, further, that under that agreement "the whole of the Engineering Staff, previously in the service of the Contractors, has been re-organized and transferred to the service of the Company, and placed under the direct authority and controul of the Chief Engineer. All contracts will hereafter be made by the Company's Officers, as well for depôt, rail and harbour service, as for locomotive power and general rolling stock; and the whole authority of construction and management be centred in and exercised by the Direction and its responsible officers, the Chief Engineer being farther amenable to the Railway Commissioners for the fulfilment of their regulations." The works are therefore now being carried on under the same system as obtains on others of similar character, and there is no longer any reason for doubting that they will be creditably prosecuted to completion.

With reference to the progress and opening of the line, we see that 31 miles of rail have been laid, and that 44 miles are on hand ready to lay early in the Spring:—that the Road will be opened to Newmarket in May, to Bradford in June, and to Barrie in July next; and that the whole length to Lake Huron is expected to be ready for traffic in September next.

With regard to the location of the line from Barrie to Lake Huron, Mr. Cumberland (prompted probably by a desire to satisfy, if that be possible, the different interests competing for it,) appears to have made a very complete examination of the country, having run no less than five lines of exploration between Lakes Simcoe and Huron, the results of which he details very fully in his Report. We doubt, however, if his perseverance, and the liberality of the Directors in authorizing such unusually extensive surveys, will be appreciated by any but the shareholders and those connected with the adopted line; for, although to an unprejudiced judgment he seems to justify his decisions, he will scarcely escape the sectional opposition always resulting from disappointment.

The recommendation made to carry the line westward to Sydenham and Saugeen, is highly judicious, for undoubtedly with 94 miles already made, this Company by a short extension, can serve the whole of the Owen Sound Tract as efficiently, much sooner, and more profitably than it could be served by any other means; and the more especially, as that Tract can scarcely be said to be yet so advanced or thickly settled as to justify any independent scheme, or offer for years to come a remunerative field for a special line. We are, therefore glad to hear, from other sources, that Mr. Cumberland has been instructed to carry his proposal into immediate execution.

Whilst referring to the *Northern Terminus of the Road, to which so* large a proportion of the Report is devoted, we cannot refrain from expressing our surprise that so little should have been said as to the Toronto Depôts, concerning which so much excitement at present prevails. On this point Mr. Cumberland writes with great caution,—indeed, we may say, with *a studied mystery or affected indecision.* But why assume that to be secret which is known to everybody? Why play the diplomat when there is nothing to withhold? Is it that mistaking the opposition of the Corporation for the feeling of the citizens, he permits himself to be frighted from his propriety; or does he pay the commercial men of the City of Toronto so poor a compliment as to believe that they desire to see their water frontage for ever lying waste and unproductive, as it is and has been. For our parts, we have known long before his Report was published, that the vacant grounds at the Queen's Wharf, and between Yonge and Bay Streets, were to be appropriated by the Northern Company; and, undoubtedly, if the interests of the City as well as of the Railroad are to be consulted, these are the positions best adapted to the purpose. In our opinion it would have become the *Chief Engineer better to have* spoken out boldly, for although *he* may entertain a very natural dread of awakening a body which is said to be harmless only when it is asleep, the selection is so judicious as to command a general support far too powerful to be overruled by any adverse corporate decision.

Appended to the Report are some interesting statistical tables, and two excellent maps—one of Canada, and the other of the Counties of York and Simcoe. Indeed, the whole document seems to have been prepared with great care and completeness, and is well worthy of attentive perusal, especially by those who desire to have an insight into the prospective trade and traffic between the seaboard and the far west, which this line is intended to accommodate, and which marks it therefore as a road peculiarly valuable to Toronto and worthy of its support.

"Seventh Report of the Board of Works (of Toronto) for 1853."

This Report, as published in the Toronto newspapers, occupies exactly twenty-seven lines, (including the date and Chairman's signature,) and recommends an expenditure of £27,108 2s. 0d.; being at the rate of about £1,004 per line! The coincidence is as strange as the standard of critical admeasurement is novel; but the brevity of the explanatory and the fullness of the financial portions of the document contrast so harshly, that we felt bound to search for something in common—some connecting link between them—and have to thank the printer's devil for supplying, with *sly drollery, that which the authors* had certainly evaded or forgotten.

Although this Report is suggestive of very grave considerations in connection with general corporate administration, we shall, in any observations we may make upon it, confine ourselves strictly within the limit consistent with the specific purposes of this Journal, which certainly extends to all works of public improvement, and especially comprises whatever is connected with the *application of sanitary* measures.

On an examination of the Estimates of the Board of Works, (which at a glance it is evident have neither been prepared or recommended under professional advice,) we perceive that an expenditure is contemplated during the current year of no less a sum than £17,644 15s. 0d., on the item of sewerage alone! We naturally enquire—"Upon what principle is this large expenditure to be made"?—"has *any* system of sewage been adopted applicable to the whole City, and capable of extension with its growth?—and, if so, is it such a system as is warranted by the experience of the past, and justified by the results of recent scientific and legislative investigation?" We are bound to say that there is evidence in this Report that it is not, and that the system therein propounded stands self-condemned. A total length of 12,138 yards of sewers is included in the estimate, divided into three classes in the following proportions:—1st. 500 yards valued at 50s. 0d; 2nd. 3,168 yards at 27s. 6d.; and 3rd 8,470 yards at 22s. 6d. Now, of the third class, (of course the smallest in area,) some is to be inserted in immediate proximity to the Bay, and some as far north as Gerrard Street—in both positions, on lines north and south:—whilst of the second class, some again will be in direct communication with the Bay, *and some on Church* Street as far north as Carlton Street—in both localities again directing north and south! Both these classes of sewers (and in them is comprised the whole system, for the 1st class is in connection with a creek, and therefore, a special provision) are further indicated as running east and west as well as north and south; so that no matter in what section of the City, whether near the Queen's Wharf or the Windmill, Front Street or the Concession Line, at a high level or a low, far or near the outlet, sewers will be found having the same sectional area, the same depth and the same direction, if the estimate of cost be any index to their capacity and depth. The alternative is unsatisfactory, for either the system or the estimate is radically wrong—the system, if but two classes of sewers are contemplated—the estimate, if more than two are to be provided; nay, *the latter in any event* for depth, is of the essence of the cost, and it must vary with the position. Is it to be credited by any one professing to common thought and observation, that two classes of Sewers will suffice for the drainage of this City in an efficient and economical manner? Is it not apparent at a glance that if only two are adopted (and especially varying so slightly in cost and area) some will be unnecessarily large and extensive, whilst others will be too small to perform their allotted duty? Experience has proved that a drain of an excessive area is almost as damaging in its results as one of deficient capacity, and certainly either in one or other respect error must be constantly repeated when the resources are within such narrow limit. The Reports of various Commissioners (as "the Health of Towns," "the Metropolitan Sanatory," and "the Supply of Water,") are clear and unanimous upon this point, and yet notwithstanding their teaching *we* continue to pursue all the errors which they condemn, and to disregard all the amendments they suggest, as though the people of Great Britain, to whom these Commissioners addressed themselves, claimed a patent right to the results of their investigations.

Another item in this Report, namely, that of "Culverts," demands comment. It occurs twenty-eight times, representing 282 Culverts, all entered at £6. Now, if by the term "Culverts," it is intended to describe vertical shafts or conductors for the surface drainage, their cost must vary with their depth, which is dependent on the depth of the sewers to which they are to be attached, and the estimates must accordingly be erroneous. But the details of cost are not of so much importance as the principles of construction, and we refer to them here only to show that custom is no security for economy. In the matter of vertical drains for instance, the old—and we wish we could say the exploded—system of the open shaft with its unchecked and offensive vapours arising from the sewer beneath, and bearing with them miasma and disease, might be *economically* superseded by a trapped conductor, even if the more modern system of independent surface drainage should be thought too extravagant a luxury.

But again, in the item of Bridges, we find eleven stone Bridges, conveniently estimated at £120 each, although eleven different localities are named for them! Are they all to be of the same height, depth, width, span and thickness? Are our street levels so very regular, is our soil so universally stable, are our streams so nicely balanced in content and velocity—that one style and manner of construction will meet every contingency? Or is it that we are satisfied to stick a "regulation pattern" at a "regulation price" anywhere and everywhere—fit or unfit, costly or economical in relation to the duty to be fulfilled? We fear the latter is the system, for on no other would an equality of estimate be justified, as on no other could the peculiarities of some of the structures be explained,—as for instance those of the Church Street Bridge, where the crown of the arch is some feet above the gradient of the road, and the drain holes ingeniously inserted in the crown of the arch!

But our limits will not permit us to enlarge. There are other points demanding comment to which we may hereafter return,—as the macadamising and planking of our streets and side walks, the water supply, and other branches of public expenditure involving *the cleanliness, health* and comfort of our city. For the present we must content ourselves by the mere expression of our belief that the Report of the Board of Works, recommending so large an outlay in so loose and slovenly a manner, and indicating such utter inefficiency of system, will not be acceptable to those in whose service it is made.

SCIENTIFIC INTELLIGENCE.

An Entomological Curiosity.

In the interesting lectures on Entomology, recently delivered in this City by Dr. Goadby, which have attracted so much attention, the learned lecturer on one occasion alluded to that pestilent insect mentioned by the celebrated traveller, Bruce, whose statements have very frequently been called in question, and he much maligned, but which have generally been found subsequently to be perfectly veracious. He mentions an insect called the Zim, at whose approach the inhabitants of whole districts take to flight, and retreat to far distant regions, where the pest has not yet arrived. The description is so extraordinary that many persons are inclined to doubt the truth of it. The following extract from the proceedings of the Entomological Society, of February 7th, will show that South Africa rejoices in an insect fully equal to the Zim:—

"Dr. Quain communicated through Mr. Spence, an account from William Oswell, Esq., of a fly (*Glossinia Morsitans*,) called "Tsetse" by the natives, (and resembling the Zim of Bruce,) in South Africa, the bite of which was fatal to all domestic animals, except the goat, but innoxious to man and the wild animals. On one occasion the writer lost forty-seven out of fifty-seven head of cattle, the bite of three or four being sufficient to cause the death of an ox; the poor animals swelling at the eyes and throat, gradually wasting away, refusing food, and dying in from twelve to fourteen days."

ON THE CAUSES WHICH RENDER BREAD STALE.—It has been generally considered that fresh bread loses water when passing into the stale state, and that this is the sole cause of the metamorphosis. Boussingault shows that this change is effected even when the bread is kept in a damp cellar, the hardest and most brittle crust becoming tough and flexible.

A loaf kept in a warm, dry room for six days, at the end of which time it was perfectly stale, had lost only 0.01 per cent. from which it is quite clear that the staleness could not have arisen from a loss of water. By heating it for some time, up to 158° Fahrenheit, it became quite fresh, having lost 3½ per cent. of water.

Various other experiments were instituted which showed the same result; in a tin plate cylinder closed with a stopper, the author completely restored stale bread to the fresh state in the course of an hour, by a temperature of 122°—140° Fahrenheit, produced by a water bath.

The staleness of bread results, therefore, from a change in its molecular condition, altered by the application of heat, and not from a loss of water.—*Comptes Rendus*, p. 588.

TELLURIUM.—It is said that this metal has lately been obtained in large quantities during the working of the gold ores of Transylvania, and, although hitherto so rare, will shortly be brought into the market by the pound.

REMEDY FOR THE STINGS OF BEES.—M. Gamprecht recommends rubbing the stung place with the freshly-expressed juice of the honey-suckle (*Lonicera Caprifolium*.) The expressed juice may be kept in closely-stoppered bottles for this purpose.

On Winiwarter and Gersheim's Patent "Gunprimers," and Composition for Fire-arms," by MR. WINIWARTER, *of Vienna*.—The various applications included in Gersheim's patent all more or less depend on the nature and properties of their new composition powders; which, at the same time that they may be employed to replace gunpowder as a propelling power, may also be used instead of fulminating powder, as a means of inflaming or firing. These patent explosive compositions consist of various well known explosive substances: namely chlorate of potash, fulminating mercury, fulminating zinc, amorphous phosphorus, and binoxide of lead. But to each of these different mixtures, a solution of gun-cotton or collodion is added as a cement; and the application of this substance is the chief peculiarity of the invention.

Monthly Meteorological Register, at St. Martin, Isle Jesus, Canada East, February, 1853.

Nine Miles West of Montreal.

[BY CHARLES SMALLWOOD, M. D.]

Latitude—45 deg. 32 min. North. Longitude—73 deg. 36 min. West. Height above the Level of the Sea—Estimated Height about 30 ft.

Day.	Barom: corrected and reduced to 32° Fahr.			Temp. of the Air.			Tension of Vapour.			Humi'y of the Air.			Direction of Wind.			Mean Velocity in Miles per Hour.			Rain in Inch.	Snow in Inch.	Weather, &c.—A cloudy sky is represented by 10; a cloudless sky by 0.			REMARKS.
	6 A. M.	2 P. M.	10 P.M.	6 A. M.	2 P.M.	10 P.M.	6 A. M.	2 P. M.	10 P.M.	6 A.M.	2 P. M.	10 P.M.	6 A. M.	2 P. M.	10 P. M.	6 A. M.	2 P. M.	10 P.M.			6 A. M.	2 P. M.	10 P. M.	
1	30.089	30.016	29.887	—12	12.5	4	.028	.071	.058	1.00	.82	1.00	N E b E	N E b E	N E b E	Calm.	2.20	3.96			Clear.	Clear.	Clear.	Auro.Bor. Zod.Light.
2	29.9·4	29.750	.592	9	42	39	.071	.243	.255	1.00	.85	1.00	N N E	S W	S	0.74	2.14	10.14			Lgt. Cirr.	l'gt cirr 4	Rain 8 p.m	
3	.767	.846	.912	37	38	27	.238	.236	.156	1.00	.95	.94	S W	S W	N W	14.75	8,01	8.12	Inap.		Str. 10.	C.C. St. 3	Clear.	
4	.820	.862	.897	30	39	37	.186	.240	.238	1.00	.97	1.00	E	S	W S W	3.12	5.30	5.02	0.10		Str. 10.	Rn.,8a.m.	Str. 10.	
5	.932	.800	.712	34	36	32	.214	.230	.199	1.00	.100	1.00	N E b E	N E b E	N E b E	Calm.	4.12	5.24	0.42		Fog.	Rain.	Rain.	
6	.718	.990	.991	30.5	34	17	.186	.195	.116	.98	.91	1.00	N N E	W	W	8.00	Calm.	Calm.		1.00	Sleet.	Snow.	Clear.	
7	.998	.893	.815	4	23	.18	.058	.106	.120	1.00	.73	1.00	N b W	N b W	W N W	Calm	1.16	Calm.			CumSt.4.	CumStr6	Clear.	
8	.886	.861	.812	3	31.5	10	.055	.135	.089	1.00	.69	1.00	W N W	W N W	S W	Calm.	Calm.	Calm.			Clear.	Clear.	Clear.	Aurora Bor. at 4 a.m.
9	.733	.831	.841	18	20	— 1	.120	.078	.015	1.00	.63	1.00	W N W	W N W	N W	Calm.	17.21	6.81			Clear.	Clear.	Clear.	Zod.Light, very brigt
10	.681	.160	.418	— 7	27	21	.035	.118	.128	1.00	.70	.95	E N E	S S E	S S E	0.57	5.84	6.21		0.65	Clear.	Str. 10.	Snow.	
11	.312	.296	.298	21	43	30	.150	.272	.186	1.00	.92	1.00	S b W	S b W	W N W	21.20	12.21	9.50		1.65	Str. 10.	CumStr9	CumStr.9	
12	.800	.921	.931	—1.5	20	— 1	.051	.103	.038	1.01	.87	.83	N W	N W	S b E	18.02	1.12	1.64			Clear.	Clear.	Clear.	
13	.809	.437	.337	— 7	8	10.5	.035	.058	.075	1.00	.80	1.00	N E	N E	N b W	5.62	8.29	7.17		6.70	Str 10.	Snow.	Snow.	
14	.475	.924	.760	5	15	0	.019	.081	.048	.78	.84	1.00	N N W	N W	W b N	12.07	15.41	11.65			do.	CumStr.8	Clear.	Aur.Bor.till daylight
15	30.031	.909	.827	—18	19	9.5	.020	.087	.071	1.00	.75	1.00	N E	E S E	N E	1.75	0.89	3.81		1.20	Clear.	Snow.	Str. 10.	
16	29.765	.493	.298	10	22	24	.073	.120	.130	1.00	.94	1.00	N E b E	N E b E	N N W	9.26	5.00	5.62		7.60	Str. 10.	Snow.	Str. 10.	
17	.565	.696	.831	20	22.5	8	.110	.113	.058	.95	.86	.80	N N W	NW b W	N N W	13.91	25.53	16.86			CumStr.9	CumStr4	Cirr. 4.	
18	.878	.747	.717	—12	21	— 3	.026	.087	.043	.93	.62	1.00	N E	S S W	W b S	7.47	1.19	2.50			Clear.	Clear.	Lgt. Cirr.	Lunar Halo at 9 p.m.
19	.730	.521	.479	—13	29.5	— 3	.025	.094	.043	.93	.76	1.00	W	S S W	S W	Calm.	Calm.	0.12			Clear.	Clear.	Clear.	
20	.373	.279	.386	— 5	29.5	— 1	.036	.130	.043	.96	.70	.90	W	S W	NW b W	0.50	2.62	0.94			li'gt cir.	Clear.	Clear.	Aurora Borealis.
21	.547	.537	.609	— 2	33.	16	.013	.170	.112	.96	.79	1.00	W b S	W S W	S W	5.10	5.55	3.81			Clear.	Clear.	Clear.	Lunar Halo.
22	.469	.369	.336	21.5	25	32	.123	.124	.199	.94	.79	1.00	S S E	N E b E	N b E	3.00	2.90	0.18		3.30	Str. 10	Snow.	sli'gtrain	
23	.281	28.993	28.938	30	34	25	.180	.195	.155	.98	.91	1.00	N E b E	N N E	N W	2.29	14.44	16.25		15.71	Snow.	Snow.	Snow.	
24	.239	29.309	29.164	69.5	28	9	.039	.123	.067	.94	.68	.93	W S W	W	W N W	20.45	15.90	12.37			CumStr.4	CumStr4	C ear.	
25	.55·	.541	.642	5	25.·	14	.018	.129	.083	.95	.88	.93	W N W	W N W	N	6.30	11.41	10.90			Clear.	C.C.Str.8.	CumStr 4	Zod.light elonga. 47°
26	.747	.731	.789	— 5	31	10	.038	.130	.062	1.00	.60	.80	W	W	W	5.27	4.00	3.97			Clear.	Cirr. 2.	Clear.	Do. do.
27	.915	.931	.950	—65	29	7	.000	.120	.065	.83	.58	1.00	N E	· N E	N E	0.06	0.72	0.70			Str. 4.	Clear.	Clear.	Do. do.
28	.830	.635	.532	10	27.5	21	.069	.131	.116	.94	.80	1.00	N E b E	N E b E	N E b E	7.50	9.00	18.28		13.25	Str. 10.	Snow.	Snow.	

Barometer.
- Highest, the 1st day - - - - - - 30.089
- Lowest, the 23rd day - - - - - - 28.938
- Monthly Mean - - - - - - - —.654
- " Range - - - - - - - - 1.151

Thermometer
- Highest, the 11th day - - - - - 43.0
- Lowest, the 15th day - - - - - —18.0
- Monthly Mean - - - - - - - 16.36
- " Range - - - - - - - 61.0

Mean of Humidity—.906.
Greatest Intensity of the Sun's Rays—69.0.
Most Prevalent wind—N. E. by E.
Least do. do. E.
Most Windy Day—the 24th day.
Mean Miles per Hour—19.55.

Least Windy Day—the 8th day.
Mean Miles per Hour—inapp.
Snow fell on 9 days, amounting to 51.06 inches.
Rain fell on 3 days, amounting to 0.52 inches.
Aurora Borealis visible at observation hours, on 4 nights.
Lunar Halo, on 2 nights.
Zodical Light on the 25th—Elongation, 47°.

The Electrical state of the Atmosphere, has been marked *generally* by feeble intensity of a *Positive* character, and on the 13th, 15th, and 26th days, indicated, for several hours each day, a high Tension of *Positive* Electricity; and from 9 a. m. to 2 p. m., on the 22nd day, about an equal Intensity of Negative Electricity.

Errata in Report for January.—For "Aurora Borealis visible at Observation Horizon—2nd night;" read—Aurora Borealis visible at Observation hours, on 2 nights.

Monthly Meteorological Register, at Her Majesty's Magnetical Observatory, Toronto, Canada West.—February, 1853.

Latitude 43 deg. 39·4 min. North. Longitude, 79 deg. 21 min. West. Elevation above Lake Ontario : 108 feet.

Magnet	Day.	Barom. at tem. of 32 deg. 6 A. M.	2 P. M.	10 P. M.	MEAN.	Temperature of the air. 6 A. M.	2 P. M.	10 P. M.	M'S.	Tension of Vapour. 6 A. M.	2 P. M.	10 P. M.	M'S	Humidity of Air. 6 A. M.	2 P. M.	10 P. M.	M'S	Wind. 6 A. M.	2 P. M.	10 P. M.	Rain in Inch.	S'nw in Inch.
						°	°															
c	1	29.806	29 696	29.656	29. 715	30 2	33 4	30.5	31 33	0.147	0.171	0.155	0.155	88	90	91	91	E S E	E	E b N	- -	- -
b	2	.578	.355	.610	. 536	35 2	40 1	35.9	37 07	.186	.214	.189	.190	91	87	86	87	E	S	W b S	Inap	- -
ac	3	.820	.898	.805	. 839	30 9	35 ?	31 1	33 33	.113	.160	.176	.16	82	79	91	85	W	S	E	0 325	- -
c	4	.459	.616	.834	. 666	35 5	43 4	35 2	37 58	.291	.219	.167	.191	97	99	82	81	E	W S W	S W b W	- -	- -
c	5	.874	.821	.658	. 782	35.2	31.5	21.6	28.65	.182	.155	.114	.115	89	90	81	89	S W b W	N	N	- -	6 0
b	6	.741	.937			18.2	22 9			.087	.167			83	53			N N W	N W b N	N N W	- -	- -
b	7	.925	.823	.870	. 873	3 6	20.6	8 6	11.20	.016	.032	.055	.061	82	81	80	82	N b E	N N W	N N W	- -	- -
b	8	.873	.772	.803	. 815	–0 6	29 2	20 6	17 22	.038	.098	.097	.075	83	60	81	75	N	S W b S	N W b W	- -	0 1
a	9	.859	.853	.717	. 804	10 8	13 8	13 2	12 67	.0 .7	.047	.051	.05?	88	51	76	72	W b N	W b S	W S W	- -	0.2
c	10	.317	.074	.102	. 160	20.0	27 1	30 9	26 37	.095	.135	.130	.126	84	99	76	82	S S W	S W	S W	- -	0 2
a	11	.102	.137	.456	. 260	33.4	38 8	20 0	23 79	.151	.177	.097	.140	80	75	87	82	S W	S W	N W b W	0.050	0.1
ad	12	.756	.801	.688	. 718	8 8	16.5	11.1	12.72	.058	.071	.059	.061	83	73	78	74	N	N E b N	N N E	- -	0 2
cd	13	.350	.293			19 4	27.1			.096	.121			83	74			E	W	W	- -	0 3
b	14	.654	.727	.849	. 761	15 1	19 0	9 5	11 38	.072	.077	.056	.065	80	71	78	73	N W b W	N N W	W N W	- -	0.5
cd	15	.723	.571	.651	. 650	23 3	34 5	24.3	27 22	.105	.165	.107	.127	82	86	81	83	S	S W b S	S S W	- -	1.6
b	16	.480	.255	.560	. 433	32.3	35 0	26.2	30 62	.168	.193	.129	.15?	93	95	88	90	S b W	N E	W b N	- -	1.0
b	17	.810	.832	.797	. 815	18 0	24 1	17.5	19 59	077	098	.035	.087	75	74	91	79	W	W	Calm.	- -	0.2
c	18	.713	.626	.656	. 651	12.9	19 0	7.9	12.15	.063	.085	.047	.063	76	80	69	76	N E b N	E N E	N N W	- -	- -
c	19	.630	.468	.367	. 451	10 4	20 0	15.1	15.13	.060	091	073	.076	80	81	80	81	W b N	N N E	N N E	- -	- -
	20	.275	.302			19 0	19 3			.095	.087			90	80			W S W	N W b N	W b S	- -	- -
ce	21	.473	.413	.398	. 430	6 5	27 4	25 9	19.90	.055	.122	.131	.101	87	81	88	86	W	S W b S	S W	- -	1.5
c	22	.189	.197	.286	. 231	32 7	37.7	29 9	32 97	.174	.195	.133	160	91	87	80	88	S E b S	Calm.	N b W	Inap	0.2
a	23	.210	.185	.351	. 251	22.3	19 0	16 8	18 80	.093	.075	.079	.085	75	69	81	79	N N W	N W b N	N W	- -	- -
b	24	.493	.479	.570	. 522	12 3	26 2	21 9	19 90	.061	.082	088	.077	75	56	73	68	N W b N	N W b W	W S W	- -	0.2
a	25	.594	.582	.631	. 607	21 8	31 6	27.4	25 82	.101	.111	.115	.118	84	80	75	79	W b S	N W b N	N E	- -	- -
b	26	.686	.686	.727	. 701	19.7	35 9	27.3	25.97	.093	.145	.133	.120	84	69	88	80	N b E	S S W	N N E	- -	- -
c	27	.755	.629			24.8	35 7			.127	.189			91	91			N E b N	E	E b N	0 510	0 3
c	28	.337	.149	.230	. 235	35 0	36 6	31.8	35.15	.192	.209	.191	.194	95	93	95	95	E b N	E N E	Calm	0.145	- -
	M	29 539	29 515	29 597	29 582	21.07	28 90	22 92	21 05	0 110	0.135	0 111	0 117	85	79	83	82	MPs 6.63	MPs 8.87	MPs 6 67	1 030	12.6

Sum of the Atmospheric Current, in miles, resolved into the four Cardinal directions.

North.	West.	South.	East.
2031.65	2215 79	921 32	941.18

Mean velocity of the wind - - 7 29 miles per hour.
Maximum velocity - - - - - 23 9 mil's per h'r, from 8 to 9 p.m. on 5th.
Most windy day - - - - - 23rd : Mean velocity, 16.75 miles per hour.
Least windy day - - - - - 19th : Mean velocity, 3.02. ditto.
Most windy hour - - - - - noon: Mean velocity, 9.13 ditto.
Least windy hour - - - - - midnt: Mean velocity, 5.87 ditto.
Mean diurnal variation - - - 3.26 miles.

The column headed "Magnet" is an attempt to distinguish the character of each day, as regards the frequency or extent of the fluctuations of the Magnetic declination, indicated by the self-registering instruments at Toronto. The classification is, to some extent, arbitrary, and may require future modification, but has been found tolerably definite as far as applied. It is as follows:—

(*a*) A marked absence of Magnetical disturbance.
(*b*) Unimportant movements, not to be called disturbance.
(*c*) Marked disturbance—whether shewn by frequency or amount of deviation from the normal curve—but of no great importance.
(*d*) A greater degree of disturbance—but not of long continuance.
(*e*) Considerable disturbance—lasting more or less the whole day.
(*f*) A Magnetical disturbance of the first class.

The day is reckoned from noon to noon. If two letters are placed, the first applies to the earlier, the latter to the later part of the trace. Although the Declination is particularly referred to, it rarely happens that the same terms are not applicable to the changes of the Horizontal Force also.

Highest Barometer - - 29 937, at 2 P. M., on 6th } Monthly range:
Lowest Barometer - - 29.074, at 2 P.M., on 10th } 0 863 inches.

Highest observed Temp. - 43.4, at 2 P. M., on 4th } Monthly range:
Lowest regist'd Temp. - —1.4, at A.M., on 8th } 44 8
Mean Highest observed Temperature - - 29.75 } Mean daily range:
Mean Registered Minimum - - - - - 15.35 } 14.40
Greatest daily range - - - - -35 4 from 2 P.M.on 11th, to 7A.M. on 12th.
Warmest day - - 4th - - - Mean Temperature - 37 58 } Difference:
Coldest day - - - 7th - - - Mean Temperature - 11.20 } 26.33

The "Means" are derived from six observations daily, viz., at 6 and 8, A. M., and 2, 4, 10 and 12, P. M.

Comparative Table for February.

Ye'r	Temperature. Mean.	Max.	Min.	Range.	Rain. D'ys	Inches.	Snow. Dy's	Inch.	Wind. Mean Velocity.
	°	°	— °	°					
1840	28 03	49.1	— 8 3	57.4	8	1.475	6	Not reg'd	Miles.
1841	22.61	43 4	— 0 3	43 7	1	inapp.	9		--
1842	27.54	48.7	2 5	46 2	8	3 625	9		--
1843	14 97	37 5	—10 2	47 7	1	0.475	21	14 4	--
1844	27 31	47 1	— 0 4	47 5	4	0 430	7	10.0	--
1845	26.81	46.6	— 3 9	50 5	5	imperfect	9	19.0	--
1846	20.80	41.4	—16 2	57 6	0	0 000	13	46 1	--
1847	22 49	41.2	— 1.0	42 2	2	0.550	13	27.3	--
1848	25 95	46 9	— 0 6	47 5	4	0.775	8	10.8	5 69
1849	20.01	41 1	— 9.2	50 3	2	0 210	13	19 2	6.58
1850	26 38	49 2	4 3	44 9	9	1 225	9	23.1	7 61
1851	28 27	50 2	1 3	48.9	7	2 000	4	2 4	6.94
1852	23 82	41 2	— 3 2	44 4	3	0 650	11	13 0	6 42
1853	24.06	43 4	— 0 6	44.0	4	1.030	15	12.6	7.29
M'n	24.30	44.79	— 3 27	48 06	4.1	1.007	10.5	17.99	6.75

Royal Institution, January 21.

"OBSERVATIONS ON THE MAGNETIC FORCE," BY PROF. FARADAY.

Inasmuch as the general considerations to be brought forward had respect to those great forces of the globe exerted by it, both as a mass and through its particles, namely, Magnetism and Gravitation, the attention was first recalled briefly to certain relations and differences of the two which had been insisted upon on former occasions. Both can act at a distance, and doubtless at any distance; but whilst gravitation may be considered as simple and unpolar in its relations, magnetism is dual and polar. Hence, *one* gravitating particle or system cannot be conceived to act by gravitation, as a particle or system, on itself; whereas a magnetic particle or system, because of the dual nature of its force, can have such a self-relation. Again, either polarity of the magnetic force can act both by attraction and repulsion; and not merely so, but the joint or *dual* action of a magnet can act also either by attraction or repulsion, as in the case of paramagnetic and diamagnetic bodies: the action of gravity is always that of attraction. As some further relations of the sun and the earth would have finally to be submitted, the audience were reminded, by the use of Arago's idea, of the relative magnitude of the two; for, supposing that the centres of the two globes were made to coincide, the sun's body would not only extend as far as the moon, but nearly as far again, its bulk being about seven times that of a globe which should be girdled by the moon's orbit. For the more careful study of the magnetic power a torsion balance had been constructed, which was shown, and its mode of operation explained. The torsion wire was of hard drawn platinum, 24 inches in length, and of such diameter that 28.5 inches weighed one grain. It was attached as usual to a torsion head and index. The horizontal beam was a small glass tube, terminated at the object end by a glass hook. The objects to be submitted to the magnetic force, were either cylinders of glass, with a filament drawn out from each, so as to make a long stiff hook for suspension from the beam, or cylindrical bulbs of glass, of like [illegible], but larger size, formed out of glass tube; or other matters. The fine tubular extremities of the bulbs being opened, the way through was free from end to end; the bulbs could then be filled with any fluid or gas, and be re-submitted many times in succession to the magnetic force. The source of power employed was at first a large electro-magnet; but afterwards, in order to be certain of a constant power, and for the advantage of allowing any length of time for the observations, the great magnet, constructed by M. Logeman upon the principles developed by Dr. Elias, (and which, weighing about 100 lbs., could support 430 lbs., according to the Report of the Great Exhibition Jury), was purchased by the Royal Institution and used in the inquiries. The magnet was so arranged that the axis of power was five inches below the level of the glass beam, the interval being traversed by the suspension filament or hook, spoken of above. When a body is submitted to the power of a magnet, it is affected as to the result, not merely by the magnet, but also by the medium surrounding it; and even if that medium be changed for a vacuum, the vacuum and the body still are in like relation to each other. In fact the result is always differential; any change in the medium changes the action on the object, and there are abundances of substances which when surrounded by air are repelled, and when by water, are attracted upon the approach of the magnet. When a certain small glass cylinder, weighing only 66 grains, was submitted on the torsion balance to the Logeman magnet surrounded by air, at the distance of 0·5 of an inch from the axial line, it required 15° of torsion to overcome the repulsive force and restore the object to its place. When a vessel of water was put into the magnetic field, and the experiment repeated, the cylinder being now in the water was attracted, and 54°·5 of torsion were required to overcome this attraction at the given distance of 0·5. If the vessel had contained a fluid exactly equal in diamagnetic power to the cylinder of glass, neither attraction nor repulsion would have been exerted on the latter, and therefore the torsion would have been 0°. Hence the three bodies, air, glass (the especial specimen), and water, have their relative force measured in relation to each other by the three experimental numbers 15°, 0° and 54°·5. If other fluids are taken, as oil, ether, &c., and employed as the media surrounding the *same glass cylinder*, then the degrees of torsion obtained with each of them respectively, shows its place in the magnetic series. One great object in the construction of an instrument delicate as that described, was the investigation of certain points in the philosophy of magnetism; and amongst them especially, that of the right application of the law of the inverse square of the distance as the universal law of magnetic action. Ordinary magnetic action may be divided into two kinds: that between magnets permanently magnetised and unchangeable in their condition, and that between bodies of which one is a permanent unchangeable magnet, and the other, having no magnetic state of its own, receives and retains its state only whilst in subjection to the first. The former kind of action appears in the most rigid and pure cases, to be subject to that law, but it would be premature to assume beforehand, and without abundant evidence, that the same law applies in the second set of cases also; for a hasty assumption might be in opposition to the truth of nature, and therefore injurious to the progress of science, by the creation of a preconceived conclusion. We know not whether such bodies as oxygen, copper, water, bismuth, &c., owe their respective paramagnetic and diamagnetic relation to a greater or less facility of conduction in regard to the lines of magnetic force, or to something like a polarity of their particles or masses, or to some as yet unsuspected state, and there is little hope of our developing the true condition, and therefore the cause of the magnetic action, if we assume beforehand the unproved law of action and reject the experiments that already bear upon it:—for Plucker has distinctly stated as the fact, that diamagnetic force increases more rapidly than magnetic force, when the power of the dominant magnet is increased; and such effect is contrary to the law above enunciated. The following are further results in relation to this point. When a body is submitted to the great unchanging Logeman magnet in air and in water, and the results are reduced to the centigrade scale, the relation of the three substances remain the same for the same distance, but not for *different* distances. The result of experiment proves that the greater the distance of the diamagnetic bodies from the magnet, the more diamagnetic is it in relation to water, taking the interval between water and air as the standard: and it would further appear, if an opinion may be formed from so few experiments that the more diamagnetic the body compared to air and water, the greater does this difference become. At first it was thought possible that the results might be due to some previous state induced upon the body, by its having been nearer to or farther from the magnet, but it was found that whether the progress of the experiments was from small to large distances, or the reverse; or whether, at any given distance, the object was previous to the measurement held close up to the magnet or brought from a distance, the results were the same;—no evidence of a temporary induced state could in any of these ways be found. It does not follow from the experiments, if they should be sustained by future researches, that it is the glass or the bismuth only that changes in relation to the other two bodies. It may be the oxygen of the air that alters, or the water, or more probably all these bodies; for if the result be a true and natural result in these cases, it is probably common to all substances. The great point is that the three bodies concerned, air, water, and the subject of the experiment, alter in the degree of their magnetic relations to each other; at different given distances from the magnet the ratio of their magnetic power does not, according to the experiments, remain the same; and if that result be confirmed, then it cannot be included by a law of action which is inversely as the square of the distance. The cause of this variation in the ratio of the substances, one to another, if it be finally proved, has still to be searched out. It may depend in some manner upon the forms of the lines of magnetical force, which are different at different distances; or not upon the forms of the lines but the amount of power at the different distances; or not upon the mere amount, but on the circumstances that in every case the body submitted to the experiment has lines of different degrees of force passing through different parts of it, (for however different the magnetic or diamagnetic conditions of a body and the fluid surrounding it, they would not move at all in relation to each other, in a field of equal force:) but whatever be the cause, it will be a concomitant of magnetic actions; and therefore ought to be included in the results of any law by which it is supposed that these actions are governed. On the present occasion a passage was quoted from Newton which had since been discovered in his works, and which, showing that he was an unhesitating believer in physical lines of gravitating force, must from its nature, rank him amongst those who sustain the physical nature of the lines of magnetic and electrical force: it is as follows, in words written to Bentley:—"That gravity should be innate, inherent, and essential to matter, so that one body may act upon another at a distance through a *vacuum*, without mediation of anything else, by and through which their action and force may be conveyed from one to another, it is to me so great an absurdity, that I believe no man who has in philosophical matters a competent faculty of thinking, can ever fall into it. Gravity must be caused by an agent acting constantly according to certain laws; but whether this agent be material or immaterial, I have left to the consideration of my readers." Finally, reference was to be made to Sabine's remarkable observation, sustained as it has been by Wolf, Gautier, and others, of certain coincidences existing between the appearance of solar spots and the diurnal variation of the magnetism of the earth. Schwabe has been engaged in carefully observing the spots on the sun since the year 1826. He has found them gradually to increase in number and size from year to year, and then decrease, and so on in a regular period of about ten years. Lamont (Dec. 1851) was induced by recent researches in atmospheric magnetism, to examine the daily magnetic variation in declination, and found that, as a whole, it increased and diminished, and then increased again, having a regular variation of about ten years: the year 1844 was given as a minimum variation of 6'·61 and the year 1848 as presenting a maximum variation of 11'·15. Sabine (March 1852) in searching for periodical laws amongst the mean effects of the larger magnetic disturbances, found a simultaneous period of increase and decrease both at Hobarton and Toronto, on opposite sides of the globe; the minimum effect was in 1843, and the maximum effect in 1848, according therefore almost exactly with Lamont's observations at Munich. But, besides that, he pointed out the extraordinary circumstances that this similar variation of the daily magnetic declination is the same in length of period as that discovered by M. Schwabe for the solar spots, and still more that the maxima and the minima of these two most different phenomena coincide; for 1843 presents the least diurnal variation and the smallest number of solar spots, and 1848 the largest magnetic variation and the greatest number of solar observations. He has observed that the same period of increase and decrease exists with the same epochs in the diurnal variations of the magnetic inclination of the earth's magnetic force in both hemispheres. The phenomenon is general both as regards all the magnetic elements, and in parts of the globe most distant from each other. Gautier appears to have been struck with the same coincidence; but did not publish his idea until July 1852. Wolf, of Berne, who has sought far into the history of the sun spots, had the same thought, publishing it first at the end of July or beginning of August, 1852. He endeavours to trace the general condition of the spots from the year 1600, and concludes that the true length of the period is 11·11 year. As it is impossible to conceive such a coincidence in the length of the period and the time of the maxima and minima of these two greatly differing phenomena, without believing in some relation of them to a common cause; so, the observation of such a coincidence at this moment ought to urge us more than ever into an earnest and vigorous investigation of the true and intimate nature of magnetism; by means of which we now have hopes of touching in a new direction not merely this remarkable force of the earth, but even the like powers of the sun itself.