The last issue of the "Record of Science" took place in October, 1905. It was thought necessary at the time, owing to the financial situation of the Society, to suspend the publication. But there was no expectation that the suspension should be other than temporary. Application has been, year after year, made to the Government of the Province of Quebec for a restoration of the grant made in former times to the Society, but hitherto without success; and as the publication of the "Record of Science" was made conditional upon the receipt of the grant, its suspension has continued. But, during the last year, the Society resolved to resume the publication as an important part of its work, trusting that ways and means for meeting the cost should in some way be found. In the present issue, however, and in the two following ones, the purpose is to put on record the more important transactions of the Society, in the interval since the last issue was made.

LORD STRATHCONA AND MOUNT ROYAL

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LORD STRATHCONA AND MOUNT ROYAL.

By Robert Campbell, M.A., D.D.

Referring to the death of Lord Strathcona and Mount Royal, which took place on January 21st, 1914, the Natural History Society of Montreal passed the following resolution at the first meeting of the Society which followed the event:

"The Natural History Society of Montreal places on record its sense of the heavy loss it has sustained in the death of Lord Strathcona and Mount Royal, who, while resident in this city, took a deep personal interest in the affairs of the Society and acted for several years as one of its Vice-Presidents, and who, since 1900, has been its Honorary President. His extensive travels in the wilds of Canada, and his keen observation of all that came under his eye gave him a wide acquaintance with the phenomena of nature, so that he was a very practical naturalist and was always able to contribute to the discussions of the Society. He also responded liberally when appealed to for aid in furthering the objects of the Society in carrying on its undertakings. The members recall with pleasure the geniality of his bearing and hold his personality in grateful remembrance. The Society extends sincere sympathy to the Baroness Strathcona·

and her family in the great sorrow which has befallen them."

As this minute briefly indicates, the much lamented late Honorary President of the Natural History Society of Montreal was possessed of a large and accurate knowledge of the facts of Biology. The thirteen years he spent in the bleak territories of Labrador made him very familiar with the Arctic fauna and flora of those northern regions. So few were the living forms to be seen in and among the barren rocks of the inhospitable tableland that a very intimate acquaintance with the species that came under notice was easily acquired.

Donald Alexander Smith had the mental equipment which enabled him to make the most of the situation in which he found himself. Born at Forres, Morayshire, Scotland, on August 6th, 1820, of a good Highland stock, Grant and Stewart blood intermingling with that of the Smiths in his veins, he inherited a fine constitution, which stood him in good stead up to his 94th year. He received a sound elementary education in his native town at a school on the Cowlair's foundation. What was of no less consequence, he had inculcated upon him in his father's house not only habits of frugality, but principles of truth, honour and integrity which laid the foundation for the illustrious career which followed. In his 18th year he set out for Canada, having received the appointment of a junior clerkship in the Hudson Bay Company's employ, several of his relatives having previously served the company. It took 50 days to make the voyage in a sailing ship. When he reached Montreal, in 1838, he was sent by Sir George Simpson, then governor of the company, to the recently-established Labrador Department, in the bleakest corner of the earth, from which the Moravian missionaries among the Eskimos had reported that foxes, minks and martens were plentiful. It was the month of September before he reached his destination, which was at Hamilton Inlet, the company having two trading posts in that district.

An earlier traveller had described the territory as "without almost any vegetation, scarcely a tree, shrub or plant to be seen, except a few dwarf willows and great patches of lichens." Here he spent thirteen quiet years, but uneventful though they seemed, the manner in which they were passed affords a key to his subsequent marvellously successful life. Most of his time, of course, was taken up with trading with the Indians, who brought furs to the posts. But he had a great deal of leisure time on his hands, which he filled up with canoeing, boating, and shooting and fishing for recreation in summer. The long nights of the eight months' winter, when the thermometer often reached 50° below zero, he employed in reading, with an occasional journey on snowshoes or on dog-sledges to outlying parts of the territory adjoining the main stations of the company. On one occasion, it is stated, that he ventured on a winter journey all the way to Montreal, to seek medical treatment for an affection of the eyes, without leave of the governor, but was brusquely sent back with a reprimand to the vacant post of duty, encountering untold hardships on the way. The life spent so largely in the open air, and all the exercises which he underwent in his early manhood contributed to build up the rugged frame and to knit compactly the muscles of the man as he was known in after years. His splendid physique was a fit instrument for the very capable intellect which it embodied. Most young men in his circumstances would have succumbed to ennui and quitted the monotonous life he was compelled to live; but Donald, the name which he was reluctant to relinquish when made a peer, the name by which he was endeared to his mother while she lived, and which he loved to hear from the lips of Lady Strathcona to the end, found delightful and profitable occupation in the library which the company had stocked with standard works on every subject. He not only read the books but digested their contents very thoroughly, and thus developed the well furnished mind

which was the wonder of many in his after life. Few topics could be started in his presence to which he was not able to make a contribution, so diversified had been his reading in his younger years. Philosophy, History, Political Economy, Medicine and Divinity his stalwart understanding had studied and made its own. Left alone with his books and his thoughts, he had pondered much over the great problems besetting human life. The self-discipline through which he passed during these solitary winters in Labrador made him the strong man, independent alike in his thinking and acting, that he afterwards showed himself. Among other volumes in the "post's" library were works on Zoology and Botany, and these he perused with great care, so as to enable him to identify the few animals and plants inhabiting the country which he was wont to traverse. Although the descriptions and nomenclature of the books he studied differed not a little from those now employed, he knew the things and was able to differentiate them, while confessing that he could not attach to them their technical specific names. He knew all about the polar bear, the walrus, the eider-duck, and the wild goose, as well as about the fur-bearing animals, in which as a trader he was an interested expert. In like manner, he recognized the mosses, and lichens, and stunted shrubs which were found growing in the crevices of the rocks or on their surface. He also acquired a clear insight into the peculiarities of the Eskimos, of the Montaignais and other Indian tribes, with whom business brought him in contact, of whom he was ever ready to become a champion. And as he appreciated their finer native qualities, so they reciprocated his kind sympathy with them, by reposing in him implicit confidence. He was to them at once physician and priest, healing their sick, marrying them, and burying their dead. His dealings with the natives helped to make him a keen, shrewd judge of men. His shaggy brows gave to his eyes a telescopic look significant of his penetrating perception

and farsightedness. The fuller intercourse he had with mankind developed his instinctive politeness which rested on consideration for others. He became affable to a degree and no one had a finer courtesy. All these qualities he early showed, and the influence of the culture he acquired in his many-sided reading in the wilds of Labrador continued perceptible throughout his long life.

Two useful habits he formed at that time which were of service to him ever afterwards. One was that of composition. He became master of a terse, incisive style of writing. Twice a year, when the semi-annual mail arrived and departed, he sent long letters to his mother in Scotland, detailing his experiences and giving an account of how he passed his time. It is to be hoped that these communications have been preserved, and, when his full biography comes to be written, their publication will be of the greatest interest.

The other valuable habit which he early formed was the saving one. There were, of course, few temptations for the spending of money at Hamilton Inlet in any case; but he made it one of his maxims to lay by one-half of his earnings, even when, in the period of his apprenticeship, his salary was only two shillings a day. Thus was laid the foundation of his subsequent fortune. His fellow-employees in the Hudson Bay Company, perceiving his financial capacity, and greatly trusting his honesty, made him their adviser in the use to which they put their money, and this gave him influence with banking institutions, the final outcome of which was his becoming President of the Bank of Montreal.

After leaving Labrador, he spent ten more years on the shores of Hudson's Bay, and was then raised to the dignity of Chief Factor in the company's service. In 1868, his thirty years of faithful and efficient service was requited by the great corporation and he was made chief executive officer of the company, with headquarters at Montreal, taking the place so long occupied by Sir

George Simpson, who had so summarily dismissed him when he made his unauthorized visit to Montreal for medical treatment. Shortly after this, Donald Smith became a member of the Natural History Society.

His later career is so well known that there is no need to dwell on it here. His mental activity found new directions for its exercise as a railway magnate, as a friend of education, and as a statesman, in all of which he achieved great distinction.

Now that the Canadian Pacific Railway is a great running concern, the very foremost of all railway companies, one who cannot recall the early history of the enterprise has no idea of the formidable obstacles that had to be surmounted in the way of its construction. They were strong men who ventured upon the tremendous task, and Donald A. Smith was in many respects the strongest of them all. It was a great stroke of finance when he, N. W. Kittson, J. J. Hill, and George Stephen acquired the St. Paul and Pacific Railroad Company. Its possession made the building of the Canadian Pacific Railway possible; and it was because the spell of the great northwest was upon him, because he loved it on account of old associations, and had unlimited faith in its future, that Donald Smith set his heart upon seeing the enterprise of building the iron road over the mountains carried through, and inspired his associates with some of his own enthusiasm so as to keep their faces towards the stupendous task. Lord Lansdowne well characterized the work, when it was finished, when he said: "The construction of the Canadian Pacific Railway stands alone in the history of great achievements in railway building." And how large a share Donald A. Smith had in the bold undertaking, we learn from the lips of J. J. Hill, his rival, and at one time associate, in railroad building: "The one person to whose efforts and whose confidence in the growth of our country and success in early railway development is due is Sir Donald Smith." It was fitting, therefore,

that he should, on November 7th, 1885, have driven home the golden spike, which symbolized the completion of the gigantic enterprise, accompanied by the clan slogan, "Hold fast, Craigellachie." The company further honored him afterwards by calling the highest peak of the Selkirk Range of Mountains, through which the line passes, after him, "Sir Donald," Her Majesty, the late Queen Victoria, having, in 1886, conferred upon him the knighthood of St. Michael and St. George.

Donald A. Smith's interest in educational matters dates from the time when the British Association for the Advancement of Science held its annual meeting in Montreal, on the invitation of the Natural History Society. He was then brought in contact with eminent educationalists and was inspired by their enthusiasm. But it is an interesting fact that his first donation to an educational institution was made in response to an appeal from his minister, Rev. Dr. Barclay, on behalf of the Trafalgar Institute, to which he gave $10,000. This appeal set his mind aworking regarding the necessity of better educational facilities for women, which ended in the erection and endowment of the Royal Victoria College for Young Ladies. His later services to McGill University as its Chancellor and the munificent benefactions made to the institution from time to time the people of Montreal are proud to call to mind, as well as the present to the city of the splendidly equipped and endowed Royal Victoria Hospital, the joint gift of himself and his kinsman and our former fellow-citizen, George Stephen, now Lord Mount Stephen. But Lord Strathcona's interest in education and his benefactions on its behalf were not confined to Canada, his adopted country. During the period of his sojourn in Great Britain, as High Commissioner for Canada, he became successively Lord Rector and Chancellor of Aberdeen University, to the finances of which he made handsome contributions, the banquet which he provided for the faculties and graduates of the university during the period he filled office therein, be-

ing unequalled in splendour in the history of that or any other university. He also made a substantial contribution to the finances of Cambridge University, of which he became an honorary graduate.

Donald A. Smith was suddenly involved in politics. Sensitive to the honour of the great trading company of which he was the official head in Canada, when it sold to the Dominion its rights in the territory over which it had long exercised sway, and there was trouble, in 1869, over the delivery of the country to the Canadian Government, he felt called upon to do what in him lay to see that the bargain was fulfilled and the transfer made. Believing that his former relations to the people on the banks of the Red River would dispose them to listen to him, he offered to the Canadian Government to proceed at once to Fort Garry and endeavour to quiet the disturbance which had taken place against the admission of Lieutenant-Governor McDougall into the territory. Accordingly he was appointed by the Governor-General to enquire into and report upon the causes and extent of the disaffection. Armed with this document, he hastened to the scene of trouble, and ultimately succeeded in undermining the influence of Riel over the settlers around Fort Garry, although he undoubtedly put his life in danger before accomplishing this end. His quiet air of self possession, his coolness and ready judgment stood him in good stead, and so, before the Red River expedition, under Colonel Wolseley, reached the scene of hostilities, the leader of the rebellion had left the country.

When, in due time, the Province of Manitoba was constituted, he was urged to allow himself to be nominated for a seat in its first Legislature. The call was one which he felt he could not decline, and he was accordingly elected, as he was also to the Federal Parliament, when Manitoba was assigned a proportion of seats therein. It was not all plain sailing with him, however. Some of the settlers from Ontario and other sections of the east could not at first rid themselves of the suspicion

that in all things he sought to promote the interests of the Hudson Bay Company as his first concern. But in time the genuineness of his patriotism became assured, and nowhere, in after years, was he more honoured and appreciated than in the City of Winnipeg and the great west generally.

His influence in the House of Commons also rose by degrees, and was not lessened when, in 1873, he, although by temperament a Conservative, refused to condone the proved offence of Sir John A. Macdonald, of trafficing in the electoral franchise, and voted against him, showing independence and pluck. He was too fairminded a man to be an out and out partizan, and this fact made it possible for him to continue in the office of High Commissioner for Canada in London, by successive Governments, although he received his appointment from the Conservatives. He represented Montreal West for two consecutive Parliaments; and only resigned his seat when appointed to the High Commissionership in 1896. How he bore himself in that responsible position is matter of recent universal laudation. His devotion to the interests of Canada which he was in London to promote language fails adequately to describe. But while faithful to his great trust, both his heart and his mind expanded in the position which he occupied, and his vision widened so that no portion of the great British Empire was a matter of indifference to him. He became an imperialist of the imperialists. His sovereign took note of the widening scope of his interests and influence and called him to her House of Lords on June 22nd, 1897. Here again truth is greater than fiction: the simple Scottish laddie was to be a peer of the realm; and Montreal was not overlooked when this highest possible honour came to him. He would have his fellow-citizens share in it and so he chose his title Baron Strathcona and Mount Royal. The motto, too, of his coat of arms was fitting: *Perseverance*. No subject ever rendered more conspicuous service to his sovereign than he did when he

raised, equipped, sent into the field and sustained, the Strathcona Regiment of Horse, 600 strong, at a time of sore trial for British authority in South Africa. It was a fitting tribute to this great statesman that a tomb in Westminster Abbey should have been offered for receiving his remains when he passed away, in his 94th year; and although that distinguished honour was declined by his family, it was altogether in keeping with the best British traditions that a service to his memory was held in the great national temple, the most illustrious in the land joining in the tribute of admiration and respect.

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*SOME RARE FUNGI FOUND AT ST. ANDREWS, N.B.

This one of the several St. Andrews of Canada seems to us a particularly favourable locality for the collection and study of fleshy Fungi. The late Dr. Penhallow confirmed this opinion when a list of its Fungi was submitted to him, as has Prof. Peck, the State Botanist of New York, to whom difficult and uncommon species have been sent for identification. Our study of them has been only occasional, and almost altogether confined to a small island near St. Andrews. From the rarer forms, which I shall mention, and the enormous quantity of commoner varieties appearing every summer and autumn, an idea may be gained of the interesting forms of this plant-life likely to be found in all the country round about.

Of the white-spored Agarics: Agaricaceæ, the genera Amanita, Amanitopsis and Lepiota are each represented on the island by several species, almost all appearing in great abundance, no especially rare ones

* Read before the Natural History Society of Montreal, by Adaline Van Horne, Feb. 26, 1912.

yet found among them, however. The next—Armillaria is represented by thousands of its common variety, mellea, and also by the very rare imperialis of Fries. In one spot only, in woods of spruce and black birch, have we ever found this species. It appeared for several years as a group of three or four individuals. After bringing it home frequently in the vain attempt to identify it, I finally sent it to Prof. Peck, who wrote giving the name and saying:—"It is a magnificent species, and I am very glad you sent me this specimen, which I am preserving for the Museum Herbarium." It is a large plant 4 to 8 or 9 inches high, having a cap of brownish fawn colour, or even whitish, very tough and covered with fleshy scales, the margin strongly incurved. Gills pallid, then yellowish, crowded, decurrent. Stipe 3 to 4 or 5 inches long, fleshy, compact, very thick, and attenuated at the base like a cone. Ring double, whitish, grooved underneath. For the last three years most diligent search has not revealed any trace of this little group of mushrooms. A road was laid out a short distance from their habitat about the time of their disappearance, which may account for it. Mr. Vroom, of St. Stephen, a town about twenty miles from St. Andrews, told me that this past autumn he had found a remarkable fungus in great abundance about St. Stephen. After some study he identified it as this Armillaria imperialis. Although a close observer of Fungi, he had, if I remember rightly, not seen it before last season. In European works on Mycology, it is described as rare, occasionally found in pine woods. Of the five species of Tricholoma and three of Clitocybe, on my list, the only ones worthy of mention as being unusual are first—the *Tricholoma subacutum* of Peck, described by him some years ago, but not mentioned in many of the American books, not even in McIlvaine's huge work: "One Thousand American Fungi." So that, if not rare, it is at least uncommon. It is a grayish mushroom of medium size, having the umbo in the centre of

the pileus extended into a distinct, though not sharp point, as the name indicates—thereby being very noticeable. *Tricholoma equestre*, named by Linnæus, we found only once in late autumn. It has a striking appearance. Its pileus is 3 to 4 inches broad, fleshy, compact, convex, later expanded, obtuse, pale-yellow with slight reddish tinge, its disk scales often darker, the margin wavy. Flesh, white yellow tinged. Gills close, nearly free, sulphur-yellow. Stem stout, pale-yellow, 1 to 2 inches long. The *Clitocybe nebularis* of Batsch—Clouded Clitocybe, is recorded as being rare in America. It takes its name from the clouded gray appearance of its cap, which is thick, at first convex, but flat when mature, 2 to 4 inches broad. Flesh white. Gills narrow and crowded, white or yellowish. Stem 1 to 2 inches long. It is found in woods in autumn, sometimes in clusters. Its edibility is still disputed.

Of the genus Collybia, I do not remember to have seen a single species either on the island or about St. Andrews. Also no Mycena nor Omphalia. Of Pleurotus, only the ordinary ostreatus. Hygrophorus, however, we have represented by several species, two very interesting ones. The *Hygrophorus pudorinus* of Fries, or Blushing Hygrophorus, is a very beautiful mushroom. It is found in the late autumn in coniferous woods, some seasons in greatest profusion. Groups containing hundreds of specimens are not unusual. The whole fungus is suffused with a delicate pink or flesh colour. The cap smooth, darker pink towards the centre, viscid, convex, then plane, 2 to 3 inches broad. The gills thick, distant adnato—decurrent. Stem 2 to 3 inches long with white floccose squamulæ at the apex. Flesh white. The fungus has a delicious perfume of jasmine. It is edible and has a taste, which seems to be just like its fragrance. We found a few of these mushrooms before 1904. In the summer and autumn of that year fungi of all sorts were extraordinarily abundant and fine. A number of unusual species were then noted,

which were not observed before, and which have not appeared since. In October of that favourable season, this Blushing Hygrophorus appeared in the large groups I mentioned. We had failed to identify it up to that time, although we found later that it had been long known in Europe, and described in the French Mycological works. Just about this time, Dr. Peck sent us the report of the New York State Botanist for 1903, in which he described and illustrated it, I think, for the first time. Of *Hygrophorus chrysodon Fries,* we found a few specimens two or three years only. McIlvaine says of it: "A pleasant excellent species, whose rarity is regrettable." It takes its specific name from the golden tooth-like squamules or the involute margin of its white pileus, which, when dry, is shining. There are also minute adpressed golden squamules at the disk. The pileus is shaped like that of Hygrophorus pudorinus and of similar size. The white stem has pale-yellow squamules at the apex arranged in the form of a ring. The broad, thin, white, distant gills are decurrent and crisped. It may be imagined how beautiful this species is.

Of the ten varieties of the interesting genus Lactarius, we have found, perhaps, *Lactarius rufus.* Scopoli is the only one worthy of special mention, as it is considered rare. It is found in damp woods, is known by its rather large size, zoneless dark red pileus, and its intensely acrid, white milk. The flesh is pink tinged. It is said by all authors to be poisonous. Seven beautiful species of Russula are constant visitors each season. None of them rare kinds.

Of the genus Cantharellus—the Cantharellus cibarius Fries the Chantarelle, which, although reported as abundant in America and growing in great luxuriance on the island and all about St. Andrews on the edges of coniferous woods, I must mention because of its beauty and exquisite taste. It has the colour and fragrance of ripe apricots and is considered one of the best if not the

best of all the mushrooms, but it is a dish which must be cooked with great care in order that the delicate flavour may not be lost. For great heat not alone destroys it, but renders the mushrooms tough. After long experimenting, we find that they should be slowly simmered over a moderate fire for three or four hours, then the usual condiments and thickening, and a little sherry added. In Europe, where the Chanterelle is very expensive, it is much prized, and all authors give it extravagant praise. We, who live in the localities it favours, are fortunate, indeed, to have this Epicurean dainty growing in such profusion.

Cantharellus infundibuliformis (Scopoli) is not included in all American works. It is frequently found about St. Andrews. Always a large species, it is occasionally observed to be considerably over a foot in height, when it is very striking and magnificent. It is funnel-shaped, with rusty yellow, rugose scaly pileus, ashy yellow gills, which become pruinose, thick, distant and dichotomous. Stem yellow, smooth, hollow.

The most interesting and rare species of this group is *Cantharellus brevipes* Pk. We had become very familiar with Cantharellus cibarius, C. infundibuliformis, and C. aurantiacus, and with descriptions of others as given in our books, and flattered ourselves that we were rather well acquainted with the genus. So that one day when my father came in with a handful of mushrooms, and before showing them to me, asked if there was such a thing as a lilac-coloured Chantarelle, for he thought he had found one. In the haste of ignorance, I promptly said there was not, and great was my surprise and excitement at seeing several fine specimens bearing every superficial characteristic of C. cibarius except that of colour. It had some of the same soft yellow, but was for the most part tinged with a distinct lilac or purplish hue. I at first thought that some specimens of Cibarius had become host plants to a secondary fungus, but closer examination showed that this was not so. None of our

books described anything like it except McIlvaine, who included in his Cantharellus group a Cantharellus brevipes Peck, but his description differed so as to size, form, length of stem, and several other minor features and his illustration did not resemble our specimen, although his was described as lilac-tinged—that we gave up the identification in despair and sent one or two of the mushrooms to Prof. Peck. He was away from Albany on field work at the time, and when he returned, the specimens were too decayed to recognize. He wrote that he was much interested in my description, and asked that more specimens should be sent. The group my father found consisted of 8 or 9 individuals, and we had plucked them all in our study of them, so there were no more to send, and diligent search everywhere in likely habitats failed to discover any more. Each year about the time of the date of their finding, we looked in the old place, but none appeared until four years later, when my father in passing the spot found a group, again consisting of 8 or 9 individuals. This time we were more fortunate in getting fresh specimens to Prof. Peck, who said they were very finely developed examples of C. brevipes. He had seen it only once before, when he had described it in the New York State Botanist' 23rd report. It was a gratification to learn that our find was so rare a species.

Of Marasmius, we find three species, only one of which the M. cohaerens of Fries is uncommon. That we have only once observed in late autumn when heavy rains had long prevailed. Of the few remaining rather insignificant genera of the Leucosporæ, Lentinus is the only one represented with us by a single ordinary species lepideus Fries.

Proceeding to Rhodosporeæ, the rosy-spored Agarics, we have found no representatives of Volvaria, Pluteus or Entoloma, but of Clitopilus or Sweetbread mushroom we have three common varieties.

Of Ochrosporeæ—brown-spored, the group Pholi-

ota is represented by the handsome and somewhat rare Caperata (Persoon), which appears solitary. Its pileus is 3 to 4 inches broad, yellow, fleshy, but thin in proportion to its size and robust stem, ovate, then expanded, obtuse, viscid only when moist, wrinkled in pits at the sides. (This is a marked feature.) The stem 4 to 6 inches long, more than one inch thick, solid, stout, cylindrical except for the tuberous base, shining, white, scaly above the membraneous ring, and broken into squamules at the apex. Gills adnate, crowded, somewhat serrated, pale cinnamon colour. Pholiota is distinguished from all other genera of the brown-spored series by the possession of a distinct ring.

Flammula is represented by one species—*Flammula alnicola marginalis Pk.* found once in the rich season of 1904 and not observed since.

The genus Cortinarius is distinguished especially by the rusty ochreaceous colour of the spores, and by the webby character of the veil. In the young plant fine webby filaments stretch from the margin of the cap to the stem, and in many species these are so numerous that they at first conceal the gills, but they wholly or partially disappear with advancing age and sometimes leave but little trace of a collar on the stem. In some instances a few filaments adhere to the stem, on which the spores fall. In consequence of which a rusty stain or band of brown is seen on the upper part of the stem. In young plants the colour of the gills is generally unlike that of the mature ones. Later on, the gills become dusted by the spores and assume their colour, hence it is that the gills of all the species are of a uniform colour, and it is important to know the colour in the young state. Of our ten species, the *Cortinarius armillatus* of Fries is rare. Its pileus is 3 to 5 inches broad, red brick colour, at first cylindrical, then campanulate, at length flattened, dry, at first smooth, soon fibrillose. Flesh pallid, stem 3 to 6 inches long, solid, firm, and remarkably bulbous. Bulb about an inch thick, villous and

fibrillose at the base. Exterior veil woven, arranged in 2-4 distinct cinnabar rings on the stem, partial veil continuous with the upper ring, arachnoid, reddish white, It is a very noticeable species and has an odour of radish. *Paxillus involutus* Fries is our one species: a common one of the small genus Paxillus, which ends the series of the Ochrosporeæ.

Of the Porphyrosporæ—Purple-spored Agarics, our only rare example is *Agaricus hemorrhoidarius*—Shulzer—closely related to the common field-mushroom—A. campestris. Walking once along one of the island driveways, I noticed a small group by the roadside of what I thought to be fine specimens of A. arvensis, which indeed this hemorrhoidarius closely resembles in appearance. I gathered them and held them in my hand while continuing my walk. On looking down a few minutes later, I saw what was apparently blood on my hand. I thought, of course, it must have been scratched when gathering the mushrooms, then I saw that the red fluid was exuding from the broken stem of one of the mushrooms and that every part of it turned red and had a congested appearance wherever bruised. In the 45th Report of the New York State Botanist, it is said to be a rare or overlooked plant in the United States, first recorded by Prof. Peck, who found it only once growing under a hemlock tree. Hypholoma with two species closes our list of the Porphyrosporæ. The final series Melanosporæ or black-spored Agarics is represented by Coprinus atramentarius and Panaeolus retirugis, both common fungi.

Of the large family Polyporaceæ and its huge genus Boletus, we find a number of species, mostly common varieties. Its *Boletus Chromapes*, Frost, and *Boletus cyanescens*, Bulliard, are uncommon forms. The former appears to the superficial glance as very like many another Boletus. It has a pale-red pileus and whitish tubes, which become brown. But in the stem, we look for its distinguishing characteristic. It is equal or

slightly tapering upward, rough spotted, pallid, but at the base without and within a bright chrome yellow. This yellow foot is a peculiar and constant feature, by which the species may be easily recognized. *Boletus cyanescens*: a curious form is now and again found as an isolated specimen on the island or about St. Andrews. It is recorded as a sparse grower in the United States. Its cap is rather variable, but usually one of the pale buff, grayish yellow or somewhat brown shades so common among Boleti. The flesh is rigid, white, instantly changing to light blue and then to indigo colour when the cap is broken or bruised. The tubes free, white or yellowish, round and changing color like the flesh. It does not look tempting, but is said to be edible and excellent. Passing on to the family Hydnaceæ, we find the genus Hydnum represented by three not at all rare species, though not observed to be abundant in our locality. Of Helvellaceæ, we find sparingly *Helvella lacunosa* Afzel, and *Leotia lubrica* Persoon, the latter a small plant not irregular in appearance, rather like Helvella, but with a very soft, gelatinous, yellow stem. *Gyromitra esculenta* Fries of the same family, I found only once on the island at the very end of October after all other fungi had disappeared. It is of remarkable appearance and easily recognized, having a dark, chestnut red, irregularly lobed cap with brain-like convolutions. The margin attached here and there to the stem. When cut through, it was found to be hollow, whitish within, and irregular, with a few distinct ribs. The stem is whitish and slightly scurfy. *Mitrulla vitellina* Saccardo var *irregularis* Peck, another of the odd-shaped fungi belonging to this family, is not reported as very common, although in favourable seasons it is fairly abundant with us. It has a beautiful yellow colour, and looks charming in the bed of damp moss it loves to grow in. The pileus is clavate, often irregular or compressed, somewhat lobed, obtuse, glabrous, tapering below into the short yellowish or whitish stem. It is usually one

or two inches high. Its caps are curved and twisted or so irregularly-shaped that two plants are not often found quite alike. As it differs from the European species in being so irregular, Prof. Peck has added *var irregularis* to its name. Its flavour is said to be very delicate and fine, and it is sometimes eaten raw as a salad. Closely related is *Spathularia velutipes,* Cooke and Farlow, of the same golden colour. It is shaped like an apothecary's spatula, hence its generic name. It is distinguished by the broad, flattened ascophore running down opposite sides of the stem. *Hypomyces lactifluorum*—Schweinitz. Parasitic on large forms of fleshy fungi, frequently some species of Lactarius. The host plant is often so transformed as not to be recognizable. The gills entirely obliterated so that the hymenium of the Agaric presents an even orange coloured surface, on which the sub-globose perithecia are thickly bedded. I do not know that this fungus is rare, but it is puzzling to the finder, who sees it for the first time. Moderately large specimens are frequently found at St. Andrews. But one favorable season many years ago, an extraordinary group of them was seen, the specimens so large that they looked like quarters and halves of big pumpkins scattered over the ground.

The family Clavariaceæ I have left to the last, although it belongs between Thelephoraceæ and Tremellaceæ. Its most conspicuous genus Clavaria is represented by eight beautiful species. One the *Clavaria purpurea* Persoon in the discovery of which we take greatest satisfaction and pride. It is always a pleasure to me to think of the finding of this rare and beautiful Clavaria as associated with one, who has been a member and friend of this Natural History Society for many years, Mrs. Girdwood, whose love and enthusiasm for Botany and whose great knowledge of it in all its branches is an inspiration to all who have the privilege of accompanying her in rambles through the woods. As we were walking together on the island in August, 1908, we came

upon a patch of many semi-transparent little plants of beautiful Amethyst hue, growing in a damp patch of moss and somewhat shaded by the low-growing branches of a spruce tree. Certainly it was Clavaria, but very different from any form we had seen before. The little plants are fusiform, flexuous, hollow, 3 to 5 inches high, unbranched and as a rule growing singly, although some are united at the base. This species we could not find described in any of our English or American works on Mycology, but it was given in the French book of Constantin et Dufour under this name Clavaria purpurea. I sent a specimen to Prof. Peck who confirmed the attribution and said it was the first time he knew of its having been reported in America. Although this list of rare species is not a long one, and the collecting of them is spread over a period of about fifteen years, I am hoping that it is an indicator of the treasures that may be found in the future, and that Botanists who are doing research work in marine flora at the St. Andrews Biological Station may have leisure, while there, to study the fungi, which lie at the station's very door. The road, which approaches the buildings runs through deep woods, principally of conifers, and in the dark shadows one sees the gleam of the rich colour of the fungi, which flourish there in great variety and profusion.

MOUNT ROYAL ONCE AN ACTIVE VOLCANO.

*By J. S. Buchan, K.C., B.C.L.

In a paper which I read before the Natural History Society, published in the "Record of Science," Vol. 8, in January, 1901, entitled "Was Mount Royal an Active Volcano?", I endeavoured to bring together the evidence bearing on the subject, which, however, as stated in the paper, was a matter of great difficulty, as the records

*Read before the "Natural History Society", April 28th, 1913

containing the story of the Mountain have for the most part been swept away by the action of the elements during the immense period of time which has elapsed since the forces that brought the Mountain into existence were in action.

In the paper in question, it was noted that while it did not amount to a certainty, the evidence on the whole, and particularly the nature of the Essexite forming the Mountain which indicated that it had cooled at depth, tend to show that Mount Royal, or at least that part of it which now forms the mass of the Mountain, had not been an active Volcano, that the Mountain as we see it to-day was a lacolite, a mass of hardened trap, which while in a state of fusion filled a great subterranean cavity, or to be more exact, several distinct cavities which did not reach the surface, and which owing to its hardness remained when the softer limestone by which it was covered had disappeared through the action of the elements.

In support of this opinion, it seems to me the evidence still stands, as regards the great mass of the Mountain as it appears to an observer from what may be called the outside, but when it is examined from certain points on the summit, there is room for the opinion that there may also have been active conditions present, that what we know as the Mountain now, was only part of the movement, and that there may at some time have been great volcanic activity connected with it.

This brings us to a consideration of what may be called the further evidence bearing on the question. To an observer placed at certain points on the top of the Mountain, it will be seen that there are three principal peaks, one on the northeastern side, one to the southwest and the Westmount or Little Mountain which is still a covered lacolite, and that these elevations enclose a practically level plain, over 200 feet below their present summits, in which are included the Mount Royal and Cote des Neiges Cemeteries, the field near the Park Ranger's

house including a small depression near the road leading to the Look-out, and the Cote des Neiges Valley, in all an area about a mile in length by half a mile in width.

Except at the northern end, which evidently received the full force of the Arctic currents and the icefields which they carried, the outside of the Mountain slopes more or less from the summit, but to the observer viewing the interior plain, it will be seen that the sides rise somewhat steeply from the plain, thus giving it generally a crater or cup-like appearance, except at the western entrance to the Mount Royal Cemetery and the south-western end of the Cote des Neiges Valley, where the rim of the cup has been broken down and carried away by the heavy currents with their floating icefields which evidently flowed through them, the force of which is shown by the worn surface of the rocks where the covering of drift is removed.

If we examine the bottom of this cup, we find it is a solid bed of Essexite, except where a few fragments of limestone are found which have evidently been subjected to intense heat and changed to a form of marble.

To the thoughtful observer, viewing the landscape from some point on the Summit, this plain in its centre presents one of the puzzles of the Mountain. Lying as it does, about 200 feet below these summits, the question naturally arises, by what means was this great basin excavated and what became of the tremendous mass of materials which was removed from it. It is scarcely possible that it could have been removed by the action of water, or if it had been that it would have left the depression in the form which it has to-day, since although the fierce currents which swept through it have left their marks deeply graven in the rocks, the channels through which they flowed into it are comparatively small and narrow which would not have been the case if they had been of sufficient strength and volume to remove this great mass even if it were the softer limestone, and much

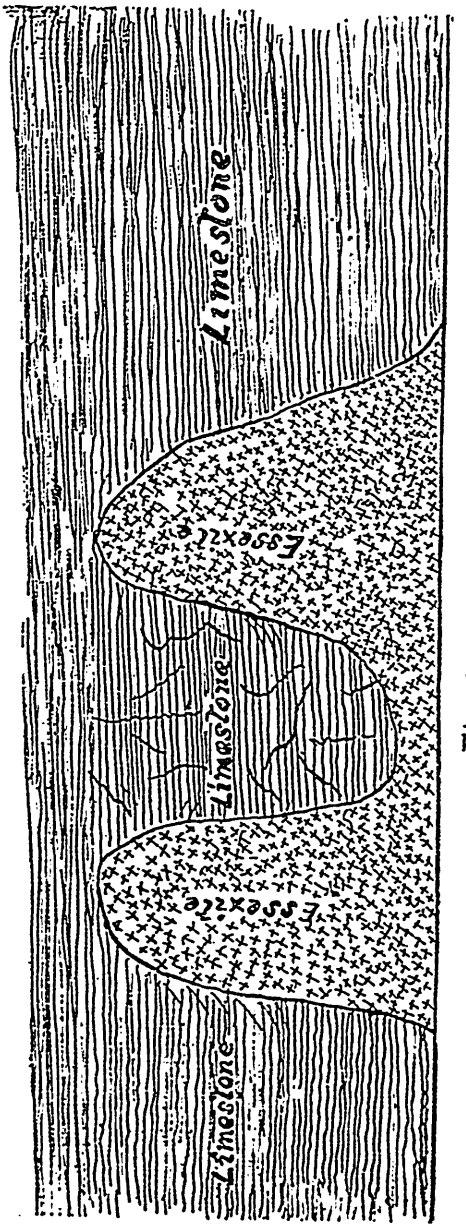


Fig. 1

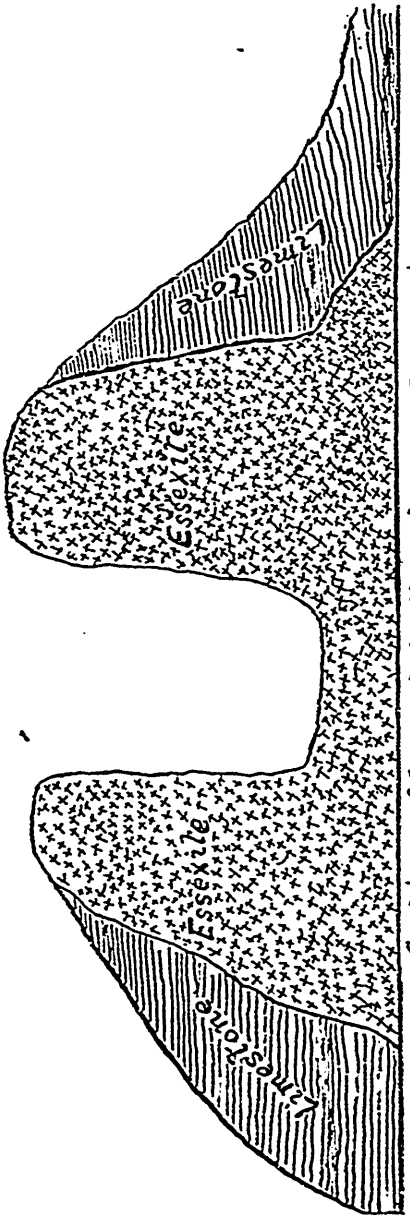
less so if the contents were the Essexite which now form its sides and floor.

If, on the other hand, we assume that the solid masses of Trap which now stand on each side of the Valley were formed by the intrusion of liquid matter from some great subterranean reservoir, into two cavities which existed where they now stand, with a considerable wall or mass of limestone between them, as shown by the sketch Fig. 1, which may have been fractured in many places but was of sufficient strength to contain it until the lava had become hardened, we have the conditions under which the elevations on the two sides of the valley could have formed.

We may also assume, from the well-known general conditions present in Volcanos, that the energy which projected the lava into these cavities may have for the time, spent itself, and that the Mountain remained in a quiescent condition a sufficient time, possibly for long ages, as in the case of Vesuvius before the eruption of A.D. 79, and so allowed the melted matter to become cooled.

If then, as is also frequently the case, there was a renewal of activity at a later period, there would be nothing improbable in supposing that the already fractured and weakened limestone between the two rigid masses of Trap was blown out of its bed, not probably at once, but by a series of long continued explosions, until there was formed an immense crater, a mile in length and half a mile in width. The fact that the ground at Cartierville is strewn with huge blocks of limestone and Essexite may have some bearing on this point, although it is possible they may have been carried there by ice.

It is to be noted here that at the Westmount end of the crater the conditions are somewhat different from those which prevail in the walls surrounding the other part of it, which are of solid Essexite. At this point the wall, especially at the northeastern end, is princi-



Section of mountain through Mount Royal Cemetery
Fig. 2

pally limestone, but it shows for a large part at least that it has been subjected to the action of intense heat, while in some places where excavations have been made there are comparatively thin sheets of Essexite which appear to have been laid up against the limestone, as might have been caused by a moderate volume of lava flowing against it and perhaps held in place by some obstruction until it cooled. At the other end of the Valley near the Cote des Neiges Cemetery gates, there is a small plain which forms the lowest part of the crater. At this point the wall and the floor consist of Essexite, but in a brecciated condition and of a finer and less crystalline character which would indicate that it had cooled more rapidly on the open floor of the crater and included in it the broken fragments produced by the exploding gases.

If this is what occurred we have in it an explanation of how this great depression, Fig. 2 was formed, which explanation is otherwise difficult to find.

No remains of lava streams are found, so far as I am aware, in the neighborhood of our Mountain, and had they existed it is scarcely probable that they would have been altogether removed, especially when much softer materials have survived.

We may thus fairly assume that any volcanic activity which may have taken place on Mount Royal, after the opening of the crater, was confined for the greater part at least, to explosions of gases, throwing out ashes and cinders and such lighter materials as may have formed a cone of great height, but so loosely laid down that it was easily removed by the waters of the glacial sea which afterwards swept over its summit. At the same time it need not be assumed that these operations were of a minor character or on a small scale as even in the absence of a true lava flow, the eruption may have been attended with tremendous violence.

The question has naturally been asked "Will Mount Royal awaken again?" To such a question, it is obvious

that a positive answer could not be given, unless by one endowed with the gift of prophecy. At the same time, if we can form any conclusion from the evidence before us, we are, I think, fully justified in saying that it is very unlikely there will be a recurrence of active conditions.

In one respect, the life of a Volcano may be compared to human life. It has its period of youth, of maturity, of old age and then death. In its old age the only evidence of life shown by a volcano is a slight escape of gases and possibly warm springs in its neighbourhood. In the case of Mount Royal, nothing of this kind, so far as I am aware, has ever been observed. Besides this, the evidence shows that there has been no eruption during or since the Pleistocene period. At various points in the crater, there are beds and banks of sand and gravel washed up by the glacial sea of that period, which beds have not been disturbed as they would undoubtedly have been if there had been an eruption since they were formed, all of which goes to support the opinion that in all probability Mount Royal will not again become an active Volcano.

NOTES ON THE NATURAL HISTORY OF THE BEAVER IN CANADA.

*By Professor A. Willey, F.R.S., McGill University.

The natural history of the beaver has been the subject of so much narrative and speculation that it is difficult to say anything new about it, so far as its more obvious peculiarities are concerned. Everybody knows how largely the beaver has bulked in the history of Canada, and that there was a time when the entire trade

*The substance of this article was communicated to the "Natural History Society", November 25th, 1912.

of the country was based upon a beaver standard, a full-grown beaver-skin being regarded as the unit of currency; and those of us who may have read the late Mr. Horace T. Martin's book on the "History and Traditions of the Canadian Beaver" (Montreal, 1892), will understand that it has formed the theme of a good deal of poetry and literature besides.

In some of its habits and instincts the beaver exhibits a certain degree of analogy with the musk-rat or musquash, and there is a striking agreement in the contour of the body; but the resemblances are superficial. These rodents have acquired their water-loving propensities independently, and the necessities of adaptation to the rigours of a northern climate have led to somewhat similar modifications. Both of them include the succulent roots or rhizomes of *Nuphar advena,* the large yellow pond-lily, in their diet; they build winter lodges which rise above the water-level, the beaver using mud and chipped branches from which the bark has been stripped for food, the musk-rat mud and rushes; their eyes and ears are small and the toes of their hind-feet are united by a web. The fur, with its outer covering of coarse guard-hairs and the soft wool or under-fur below, is very much the same in both. But whereas the scaly tail of the beaver is flattened from above downwards, the scaly tail of the musk-rat is flattened from side to side. Moreover, the lodge of the musk-rat only lasts for a season, while that of the beaver is repaired and added to from year to year. The construction of the winter lodge of the musk-rat has been described by C. L. Herrick (Mammals of Minnesota, Minneapolis, 1892).

The musk-rat is in fact related to the true rats and mice; as shown by the structure of its teeth and other characters of the skull, it is a typical member of the subfamily (Arvicolinæ) of the mouse family (Muridæ) to which the common Water-Vole of Europe and Northern Asia belongs, only it has gone farther than the latter in its adaptation to an aquatic life. The toes of the amphibious vole are not webbed and the tail is not

flattened, but its hind-feet are large and it is a good swimmer, according to one observer "striking out with its hind-legs after the fashion of a frog" (F. G. Aflalo). In the same way the musk-rat and the beaver employ the hind-feet in swimming, leaving the fore-feet or hands free to carry loads.

The beaver has a family (Castoridæ) to itself, and although belonging to the order of gnawing animals, called indifferently Rodentia or Glires, it has no direct relationship with the Muridæ. Strange as it may appear, the nearest existing relatives of the beaver are the squirrels, chipmunks, wood chucks, and marmots, all members of the squirrel family (Sciuridæ).

Thus we see that the beaver occupies an isolated position in systematic classification and it might have been expected that the development of the young would exhibit novel features, inasmuch as it has long been known that various Rodents, as, for example, the rabbit, mouse, and guinea-pig, present great differences in the very early stages of their life-history. Nevertheless nothing had been done to penetrate into the pre-natal of the beaver when I took up the investigation of it three years ago. Without going into details, it may be said that the embryology of the beaver will afford a new paradigm for that of the class Mammalia as a whole

One of the most ingenious attributes of the beaver is its capacity for suiting its labours to the nature of the district which it inhabits, so that it behaves differently in different environments, in other words, it possesses considerable power of accommodating itself to its surroundings, the only *sine quâ non* being the presence of water and vegetation. The first really authentic account of the habits of the beaver was written by Samuel Hearne, a servant of the Hudson Bay Company. In 1770, at the age of 24, he was sent out with Indian guides from the company's fort near the mouth of the Churchill River, to discover a fabulous copper mine and a mythical north-west passage to China. Although his quest for these objects was something of a wild-goose chase, he

discovered the Coppermine River and came within sight of its mouth, accomplishing the entire journey on foot, a remarkable performance occupying about two years in its achievement and involving great hardships. His report to the company was well received and was worked up subsequently into a book, which was published in 1795, three years after his death, at the age of 47. The "Journey to the Northern Ocean" has recently been re-edited from the original quarto edition of 1795 by Mr. J. B. Tyrell for the Champlain Society of Toronto (1911).

Hearne's fascinating description of the beaver community in the region of the Great Slave Lake finally disposed of many grotesque stories which were current at that time. It was quoted in part, though not very accurately, in an appendix at the end of Lewis H. Morgan's volume on "The American Beaver and His Works" (Philadelphia, 1868). This work of Morgan's contains the first description of the beaver canals, and is altogether one of the best natural history monographs of a mammal ever published in the English language, only rivalled perhaps by Sir Emerson Tennent's monograph of the elephant. An important chapter on the beaver, based on first-hand knowledge, will also be found in the first volume of Mr. Ernest Thompson Seton's great work, entitled "Life-histories of Northern Animals" (New York, 1909). The family life of the beaver in and about their houses makes the setting of steel traps opposite the submerged doors of their abodes a distressing matter to reflect upon. Hearne says that the Northern Indians captured the beavers by demolishing the houses; but then some of the things those people were capable of doing were almost beyond belief.

Next to the beaver canal the most wonderful piece of construction is the beaver dam, which Morgan described in great detail from examples which he found in the Lake Superior Iron District of Upper Michigan. The dam is the most imposing, as well as the most fatal of the

beaver's accomplishments. Its object is the formation of an artificial pond to ensure a permanent waterway to the entrances of their lodges and burrows. Like the lodge it begins in a small way and is added to and repaired from year to year. In course of time the ponds become so large as to flood the surrounding lowlands, thus killing the trees and giving rise eventually to the beaver meadows. Morgan's "Great Dam at Grass Lake" was the most remarkable of the many examples that came under his notice. It was 260 feet long, measured with a tape line along the crest; 6 feet high at the centre of the great curve, with a slope of 13 feet on the lower face.

By a singular coincidence it happened that about the same time that Lewis Morgan was assisting in the exploitation of the iron mines at Marquette, Alexander Agassiz was developing the copper mines at Calumet in another part of Michigan. He also turned his attention to the beaver and intended to write up his observations but was forestalled by Morgan, whose work he generously appreciated. An interesting letter from Agassiz to Mr. Morgan, written in 1868, shortly after the publication of the latter's book, is preserved in the recently published "Letters and Recollections of Alexander Agassiz," edited by G. R. Agassiz (Boston, 1913).

The beaver meadows attracted the notice of Sir Archibald Geikie. Describing, in his "Geological Sketches" (New York, 1882, p. 201), an excursion to the Uintah Mountains, to the south of the Bad Lands of Wyoming, he says: "No sooner had we reached the valley bottom than abundant traces of vanished glaciers made their appearance in the form of perfect crescent-shaped moraine mounds thrown across the valley* * * Each mound of rubbish had served as a more or less effective barrier in the pathway of the stream, ponding back its waters into a lake that had eventually been converted into a meadow. But far more effective than the glacier-made dams had been those of the beaver. The

extent to which the valley bottoms in this and the other mountain ranges of Western North America have been changed by the operations of this animal is almost incredible. In a single valley, for example, hundreds of acres are gradually submerged, and their cotton-wood or other tree-growth is killed. In this way the floor of the valley is cleared of timber. The beaver-ponds, eventually silting up, become first marshes and then by degrees fine meadows."

In this passage quoted from Geikie we have a lucid picture of the contrast between the factors of inertia, instinct, and intelligence. Ice, unconscious and unknowing, alters the surface of the land by the sheer weight of its physical properties; the beaver, conscious but unknowing, likewise changes the face of nature; finally man, conscious and knowing, transforms everything to suit his purposes. Lodges, dams, and canals are intelligent works, but the ultimate consequences, namely, the beaver-meadows, are unforeseen.

It is the beaver-made dams, not the glacial dams, about which people, farmers and engineers, anglers and hunters, complain. Without discussing the foundation of the complaints or attempting the quixotic task of stemming their tide, one is free to pose this question: Is it not an extraordinary and unaccountable circumstance that one of the most marvellous instincts implanted in the fur-bearing animals, which had full play for a thousand years before Columbus discovered America, should now have become an object of local and individual protest?

From the depth of the peat deposits above the beaver dams about Calumet, A. Agassiz estimated that several of these colonies must have been at least 900 years old. If we accept this estimate as being roundly correct, it is amusing to note that just at the time when the Calumet colonies were being started by emigrants from outlying districts, the beaver in Europe was providing one of the favourite dishes at the celebrated monastery of St.

Gellen in Switzerland. Amongst the "Benedictiones ad mensas" which have been handed down in the archives of that venerable establishment, there is one dedicated to the beaver: "Sit benedicta fibri saro, piscis voce salubri" —Blessed be the flesh of the fish-like beaver. Beaver remains have been found abundantly amongst the famous pile-dwellings of the Stone Age clustered around some of the Swiss lakes, but the beaver itself vanished from Switzerland some time during the 18th century. These and other facts relating to the European beaver are contained in an article on the history of the beaver in Switzerland, Germany, Norway, and North America, by Dr. A. Girtanner (St. Gallen, 1885).

Although it has been found impracticable to farm the beaver for its fur in the same way as the silver fox is being farmed on Prince Edward Island, it should be remembered that while there is no animal more easily exterminated, there are few so easy to encourage. In a "Check List of the Vertebrates of Ontario," issued by the Department of Education in Toronto (1905), the author, Mr. C. W. Nash, says with reference to the beaver: "A few years ago this valuable fur-bearing animal was perilously near to extinction in our Province, but owing to the protection wisely afforded it, the beaver is again becoming abundant in Northern Ontario. In Algonquin Park, where it is strictly preserved, they may be seen to great advantage."

In consequence of the measures of protection which have been adopted by the Provincial Governments, both in Ontario and Quebec, the life of the beaver is doubtless ensured for many years to come; but it seems a pity that there should be any difference of opinion upon such an elementary principle as to the preservation of an ancient and valuable type, whose existence adds greatly to the natural beauties and amenities of Canadian woodland scenery. It is not to be wondered at that in the midst of the storm and stress of the Middle Ages in Europe the beaver should have been allowed to depart with a bles-

sing. But it is doubtful whether there is anything that can exactly fill the place of the beaver in the natural and national life of Canada, if it should vanish from the scene.

The flattened scaly tail is not the external feature which renders the beaver unique. Alone amongst mammals the beaver has an arrangement on the second toe of each hind-foot for cleaning the fur. At first sight it looks like a double claw and was so described by Cuvier and many later writers, including Audubon and Bachman, Lewis Morgan, E. T. Seton, and others. So far as I have been able to ascertain, the suggestion that it serves as a cleaning claw first emanated from D. Girtanner (*op. cit.* 1885). He noticed that alongside and below the normal claw of the second hind-toe there is an accessory "nail-plate," which can only serve to comb the flanks of the animal, the heavy paunch deriving advantage from such a special provision to facilitate cleaning. E. T. Seton (*op. cit.* 1909, Vol. I. p. 469), figures what he calls "the split nail of the second toe on hind-foot," which he thinks may be "possibly for use as a comb and louse-trap."

What seems to be an accessory claw on the second hind-toe of the beaver is in reality a crest-like ridge developed from the nail-bed in front of and below the regular claw. The upper free rim of this crest is cornified and presents a sharp edge to the true claw, leaving a narrow chink through which the fur can be combed. The crest is a specialization of the lip of the claw-bed; this is continued round the outer side of the base of the claw and produced forwards as a vertical crest. Only the edge of the crest is hard; the sides are soft and filled with dense white fibrous tissue like the substance of the toe-ball. The claw is not separately movable upon the ridge; they move together as one piece with the terminal phalanx with which they are connected.

If we seek for analogies for the cleaning claw of the beaver, we should find nothing like the mechanism just

described. A North African rodent, known as the "gondi" (*Ctenodactylus*), has rows of cleaning bristles arching over the claws of the hind-feet. Referring to this genus, the Swedish zoologist, Tycho Tullberg, in his systematic monograph of the Rodentia (Upsala, 1899, p. 152), says that the four claws of the hind-feet are very small, thin, and sharp; above them there are numerous curved, stiff bristles arranged in rows, which serve the same purpose as corresponding structures which are found in the Chilion rodents, *Chinchilla* and *Octodon*, namely, to comb the soft fur.

Cleaning claws are known amongst birds. In the heron family (Ardeidæ) which includes herons and bitterns, the claw of the middle toe is serrated along its inner border. The nearly related families of the storks and ibises are without any serrated claw. An exactly similar kind of serrated claw on the middle toe is found in the members of the Nightjar family (Caprimulgidæ); while the nearly related Frogmouths (Podargidæ) are without it. Again we meet with it in the Barn Owls (Strigidæ), but not in the nearly related Horned Owls (Bubonidæ).

A serrated claw is found in the same position in several small families of the order Steganopodes or Totipalmatæ (all four toes connected by a web), including the Cormorants, Darters, Gannets, and Frigate-birds [see British Museum Catalogue of Birds, Vol. XXVI]. Leaving these out of consideration for the sake of simplicity, we may fix our attention on the fact that the serrated middle claw, an exceptional feature in the class of birds, occurs identically in three entirely distinct families (Ardeidæ, Caprimulgidæ, Strigidæe), whilst it does not occur in the nearest relatives of these families.

Such observations as have been made touching upon the use of the serrated claw indicate that it serves to clean the rictal bristles near the mouth and the adjacent feathers of the head. In Gilbert White's "Natural History of Selborne," edited by R. Bowdler Sharpe (Lon-

don, S. T. Freemantle, 1900), Letter 37 (Vol. I, p. 154), recounts the feeding of a Nightjar upon Melolonthid beetles which were swarming about a large oak. The letter goes on: "But the circumstance that pleased me most was that I saw it distinctly, more than once, put out its short leg while on the wind, and, by a bend of the head, deliver somewhat into its mouth. If it takes any part of its prey with its foot, as I have now the greatest reason to suppose it does these chafers, I no longer wonder at the use of its middle toe, which is curiously furnished with a serrated claw."

To this the editor (R. B. S.) adds the following footnote: "The use of the serrated claw in the nightjar has been discussed by many ornithologists. It is not likely that the foot has any seizing power, but as the bristles which beset the bird's gape may become clogged with the wings of the insects on which it feeds, it is possible that White saw the bird in the act of cleaning its rictal bristles by means of the comb on its claw."

The development of identical or analogous structures in adaptation to a common need on the part of dissimilar organisms, whilst their nearer blood relations show no trace of the modifications in question, is a phenomenon of widespread occurrence, but its precise theoretical significance is rather obscure. Adaptation itself is still one of the great unsolved mysteries of organic life.
Montreal, March 20th, 1914.

THE CRAFTY FOX.

Away back in the early nineties, on a farm in the County of Two Mountains, a fine specimen of a red fox was seen one day leisurely crossing the hills.

Having a little leisure time on my part, I took my rifle out of its case, and strapped on a pair or snow-shoes, and my foxhound was ready to accompany me without further hint.

It was a mild day, after a heavy fall of deep soft snow, in the early part of January, so I provided myself with a couple of steel spring fox traps. I knew from previous experience that a fox would not run far, but would run to earth the first chance he got, if pursued by a swift hound, when his brush and fur got loaded up with the soft snow.

When the hound took up the scent and started to run on the trail, the fox ran about a mile straight on his course, then swinging around in a circle, he doubled back in the direction he came from, and ran to earth in a little sand hill, in a small thickly wooded hemlock patch of trees, after being pursued less than a couple of miles.

The sound of the baying hound, apparently coming for some time from the same place, I went over in that direction and found the hound scratching out the sand at the mouth of the open hole, in an attempt to get at the fox.

I tied up the hound, then set the two traps in the fox hole, securing them by small chains to a near-by tree. I then led my hound home and kept him tied up for a few days, in case that he would return to the fox hole and get caught in the traps.

A couple of days afterwards, I visited the traps, but found nothing disturbed. Two days later, I visited the traps with the same result. I then was absent for a couple of days in the city, and when I returned, on the following day, I found that the fox in trying to make his escape out of the hole, had got caught in one of the traps, and set off the other.

To my great surprise, I found that the captured fox had devoured a partridge at the mouth of the hole. On examining the fresh tracks in the surrounding snow, it was clearly seen that the the partridge had been brought to the captured fox by another fox, who had done a good deal of reconnoitring around the hole before approaching near enough to give its hungry comrade a well-timed meal.

I got a companion to visit the place where the partridge had but recently been devoured, with nothing left but the scattered feathers, and everything proved conclusively that probably the hunger cries of the fox had touched the tender heart of one of its comrades, who had brought the partridge to the starving and captured fox.

I collected a bunch of some of the larger partridge feathers, some of which I still have, as a souvenir of a touching and pathetic event.

In those days, the foxes were a regular pest to the farmers in that vicinity, from the frequent depredations they made on their barn-yard fowls, and we always tried to destroy the foxes at every opportunity offered, by trapping or shooting them.

On one occasion, when my hound was running a fox trail, re seemed to have run ris quarry to earth, out on an opening, where there were very few trees, on a hill on the Robertson farm, commonly known in that vicinity as Burnside. The dog manoeuvring around a fallen tree for some time, keeping up a constant baying, I approached the place, and when I got within one hundred yards of the fallen tree, I took in the situation. I found a large maple tree, broken off almost squarely, in a decayed spot in the trunk, about eight feet from the ground. From the half decayed wood the colour was a yellowish brown, and on the top of this stump reynard was lying curled up like a sleeping cat, but very much awake, and apparently enjoying the way he had fooled the hound.

The fallen maple tree was heavily branched on all sides, and in falling the trunk was supported by the branches, four or five feet up from the ground, which only made a jump of about three feet for the fox to get from the trunk of the tree to the top of the stump, where he was so well hidden by the sameness in colour of the new break in the half rotten wood and his own yellow coat.

I only had a shot gun with me on this occasion, and I tried to get within fifty or sixty yards, to take a shot at

the fox, but before I got within that distance the fox, watching his opportunity, jumped back on to the trunk of the tree, then on to the ground from the opposite side to myself and hound, after being well rested, and fresh for another long run.

Occasionally, when my foxhound would start out on a fox hunt on his own accord, and run a trail, always by scent, sometimes for several hours at a time, I have known foxes, when they got tired running, and wanted to make the hound lose their trail, run along on the top of a rail fence, for several yards at a time, then jump back on the ground or snow again in an attempt to make the hound lose the trail. This always made the hound lose a good deal of time before he could find and take up the track again, to continue the run, but in time the hound also got wise, he would be seen climbing up, and take a sniff or two on the top rail, then run on a few yards, and repeat the operation, until he got the track on the ground or snow again, and continue running on the trail.

W. A. OSWALD.

Montreal, March 30th, 1914.

REPORT TO ROYAL SOCIETY OF CANADA FOR THE YEAR 1904-5.

By Professor Nevil Norton Evans.

On behalf of The Natural History Society of Montreal, I beg to submit the following report for the consideration of the Royal Society:

Clearly recognizing with Herbert Spencer the great value,—material, intellectual, and moral,—which a study of nature has for the individual and for the community, the Natural History Society has endeavoured to advance such study, not only among its members, but also

among the general public, by means (1) of its regular monthly meetings with their scientific communications; (2) free evening lectures, generally illustrated, for adults; (3) Saturday afternoon talks, also illustrated, for young people and children; (4) opportunities for study offered by its museum and library; (5) the publication of its scientific journal; (6) excursions into the immediate neighbourhood of the city, and trips further afield, under competent scientific leadership; and (7) a general active interest in scientific matters affecting the well being of the community at large.

With regard to the work accomplished, in pursuance of these objects, during the past year, along the several lines indicated, the following short account may be given.

(1) Regular monthly meetings have been held as usual, the programme having been as follows:

1904, Oct. 31.—"Observations upon some leaf variations and their bearing upon palæontological evidence," by Dr. D. P. Penhallow.

1904, Nov. 28.—"Additional Toadstools, edible and poisonous, collected on the Island of Montreal," by Rev. Dr. Campbell.

1905, Feb. 6.—"The relations of Fungi to the higher forms of life, with special reference to the action of decay," by Dr. D. P. Penhallow.

1905, Feb. 27.—"The development of Bacteriology," by Dr. Otto Klotz.

1905, Mar. 27.—"The results of Scientific work in connection with Flour Milling," by W. A. Gray, Esq.. (Chemist to the Ogilvie Flour Mills Co).

1905, May 1.—"Public discussion concerning the Tussock Moth and the general care of Shade Trees," by Dr. James Fletcher.

(2) The annual Somerville Course of Lectures for 1905 was as follows:

1905, Feb. 2.—"The South Seas," by Dr. Otto Klotz, Dominion Astronomer.

1905, Feb. 9.—"The place of Plants in the Economy of Nature," by Dr. D. P. Penhallow, Professor of Botany, McGill University.

1905, Feb. 16.—"The Russia of To-day," by Abner Kingman, Esq.

1905, Feb. 28.—"A Trip to the Northern Part of Hudson Bay and the Arctic Islands, on Dominion s.s. Neptune," by Commander A. P. Low.

1905, Mar. 2.—"The Geological Resources of Canada," by Dr. H. M. Ami, Dominion Geological Survey.

1905, Mar. 9.—"The Various Races of Men," by Dr. E. W. MacBride, Professor of Zoology, McGill University.

(3) The Young People's Half-hour Series of Talks on Natural History for 1905 was as follows:

1905, Feb. 4.—"The story of a piece of Coal," by J. S. Buchan, K.C., B.C.L.

1905, Feb. 11.—"The story of a Yeast Cake," by Dr. D. P. Penhallow.

1905, Feb. 18.—"The Sleep Movements of Plants," by Professor Carrie M. Derick, M.A.

1905, Feb. 25.—"Some of Mother Nature's Inventions," by Harry Bragg, Esq.

1905, Mar. 4.—"The story of a Grain of Wheat," by W. A. Gray, Esq.

1905, Mar. 11.—"The story of Sugar and Syrup," by Milton L. Hersey, M.Sc., City Analyst.

1905, Mar. 18.—"King's Cobweaver's Pipies," by C. T. Williams, Esq.

The three courses of lectures above enumerated have

been well attended, the numbers being markedly above those of former years. The average attendance at the Somerville Lectures was about two hundred, and over 1,500 children listened to the talks given for their benefit.

(4) The donations to the museum have not been quite as numerous as usual, but have been of an exceptionally valuable character. Unfortunately, the room is so completely taken up that it is impossible to exhibit new specimens. Ever increasing numbers of visitors are registered, over 10,000 having been counted last year; among these are a large number of classes, accompanied by their teachers, from the city schools, especially from the Roman Catholic, who show great interest in examining and studying the collections.

The contributions to the Library increase every year, there being at present 3,500 volumes upon the shelves, while upwards of 2,000 volumes await proper accommodation.

(5) "The Canadian Record of Science" has been published as usual, the articles being most original ones. Under the able editorship of Dr. Penhallow, it is to be hoped and expected that this journal is about to enter a new and more important era in its existence, if a small government grant, for which application has been made, can be obtained.

(6) The annual Field Day was held at Shawinigan Falls and was most successful in every way. The weather was ideal, the arrangements for the comfort of the excursionists were well carried out, and the number of those attending was the greatest on record for any similar occasion—over 450.

(7) As one of the efforts made by the Society to keep in touch with the practical life of the people, may be mentioned the discussion on the Tussock Moth, already referred to, and steps were taken to aid in the extermination of the pest. The importance of guarding against

the depredations of this insect, which elsewhere is recognized as one of the most destructive to shade trees, engaged the attention of the Society early this spring, and measures were taken, in conjunction with the civic authorities, to destroy the egg clusters before the period of hatching.

As has already been indicated, the general work of the Society has for some time past, been much hampered by lack of suitable accommodation. The building on University Street, owned by the Society, and which has been its home for nearly half a century, has become far too small for the requirements, this being especially noticeable in connection with the museum and library, and also with respect to accommodation for the important series of lectures which the Society annually conducts. Steps are now being taken to acquire a more suitable property.

As one development in harmony with its endeavours to bring people more closely into touch with nature, the Society is glad to welcome the movement of recent years, which has found expression in the establishment of special recreation grounds under the charge of the Parks and Playgrounds Association, and especially to the efforts of Sir William Macdonald with respect to an extension of Nature Study in the schools throughout the province. These and all other activities, which tend to cultivate in the young an interest in and a love of nature, are in the very best interests of all classes of the people.

During the last twelve months, seventeen new members have been enrolled, and a special effort is just being started to bring about a very considerable increase in the membership in view of the probable extension of the premises of the Society. Two of our oldest and most respected members have passed away during the last year—Dr. D. C. MacCallum and Mr. J. A. Mathewson.

OFFICERS.

The list of officers for the session of 1904-1905 is as follows:

Patron—His Excellency the Governor-General of Canada.

Hon. President—Lord Strathcona and Mount Royal.

President—Prof. D. P. Penhallow.

Vice-Presidents—Frank D. Adams, Ph.D., F.R.S.C.; Rev. Robt. Campbell, M.A., D.D.; B. J. Harrington, Ph.D., F.R.S.C.; Albert Holden, J. H. Joseph, E. W. MacBride, M.A., Sc.D.; Dr. Wesley Mills, Hon. J. K. Ward.

Hon. Recording Secretary—F. W. Richards.

Hon. Corresponding Secretary—C. E. H. Phillips.

Hon. Treasurer—Chas. S. J. Phillips.

Hon. Curator—A. E. Norris.

Members of Council—J. A. U. Beaudry, C.E., Chairman; J. S. Buchan, K.C., B.C.L.; Joseph Fortier, John Harper, Edgar Judge, H. McLaren, B.A.; Alex. Robertson, B.A.; C. T. Williams.

Superintendent—Alfred Griffin.

The Society is much indebted to the indefatigable efforts of Mr. Alfred Griffin, the Superintendent, who is not only a very enthusiastic member, but a most efficient worker.

REPORT TO THE ROYAL SOCIETY FOR THE YEAR 1905-6.

By Dr. Albert G. Nicholls.

The following report of the work of the Natural History Society, for the session of 1905-1906, is respectfully submitted for the consideration of the Royal Society of Canada.

The officers and members of the above Society have

pleasure in reporting a most successful year's work. Keeping in mind the purpose for which the association was formed, namely to encourage the study of nature among its members, to foster the love of natural objects among the general public, and, in a word, to disseminate and popularize these special branches of science, they have to a large extent followed the methods which have proved so successful in former years, but with the expectation in the comparatively near future of embracing an even larger scope. In general, the objects mentioned have been carried out by means of regular monthly meetings of a largely scientific nature; free evening lectures of a popular kind; weekly afternoon talks, usually illustrated, for children and young people; opportunities for study offered by the museum and library; the publication of its scientific organ, "The Canadian Record of Science"; excursions to places of interest in the vicinity of Montreal and an active interest in those scientific matters of importance to the well being of the general body politic.

To particularize the work done on the above lines the following account may be given:

The regular monthly meetings have been held as usual. Papers of a scientific character were presented as follows:

1905

Oct. 25.—"An Account of a Blazing Beach on the Main Coast," Prof. D. P. Penhallow.

—"A Notice of some Fossil Plants from the Pleistocene of the Abitibi River," Prof. Penhallow.

—"Note on the Geology of the Abitibi District," Dr. Wilson.

Nov. 25.—"Fungi collected at Cap-a-l'Aigle," Rev. Robt. Campbell, M.A., D.D.

—"Relations of Sun Spots and Sun Clouds," Mr. Chas. J. Stuart.

1906.

Jan. 29.—"The Distribution of Forests in Tertiary Time and their Relations to the present Great Plains," Prof. Penhallow.

—"Some Recent Studies respecting the Nuclei of the Lower Forms of Plant Life," Miss Carrie M. Derick.

Mar. 26.—"Some Recent Developments on the Production of Plant Hybrids," Miss Carrie M. Derick.

Apl. 30.—"A Remarkable Tumour of the White Birch," Prof. Penhallow.

—"Distribution of Plants in the Cretaceous Period," Prof. Penhallow.

The Annual Somerville Course of Lectures was given as follows:

Jan. 18.—"Lime, Soda, and Soap," Prof. Nevil Norton Evans, M.Sc., McGill University.

Jan. 25.—"The Labrador Eclipse Expedition," Rev. I. J. Kavanagh, S.J., M.A., B.Sc., Science Master, Loyola College.

Feb. 1.—"Food Adulteration in Canada," Dr. J. T. Donald, Official Analyst to the Dominion Government.

Feb. 8.—"Jamaica, the Isle of Springs," Theo. L. Wardleworth, F.L.S.

Feb. 15.—"The Origin of New Forms of Plant Life," Carrie M. Derick, Assistant Lecturer in Botany, McGill University.

Feb. 22.—"South and East Africa as seen during the Meeting of the British Association in 1905," Dr. John B. Porter, Prof. of Mining and Metallurgy, McGill University.

The Young People's Half-Hour Series of Talks on Natural History for 1906 was as follows:

Jan. 20.—"Buds," Carrie M. Derick, M.A.

Jan. 27.—"Story of a Piece of Wood," J. S. Buchan, K.C., B.C.

Feb. 3.—"A Talk on Plants," S. S. Bain, Esq.
Feb. 10.—"A Can of Salmon," Harry Bragg, Esq.
Feb. 17.—"By-Paths in an Invisible Garden," Dr. A. G. Nicholls, M.A., M.D.
Feb. 24.—"How Paper is Made," Chas. S. J. Phillips, Esq.

The attendance of members and others on the above courses has been very gratifying and shows an increased interest in matters scientific.

A matter worthy of special note is the Conversazione which was held under the auspices of the Society in the Natural History Building, on February 22nd. This meeting, the first of the kind held for ten years, was graced by the presence of His Excellency Earl Grey, to whom a fitting address was presented by the Society, together with a souvenir of historical interest. The conversazione was entirely satisfactory from every point of view.

The donations to the museum have not been particularly numerous this year, but have been of considerable importance.

Contributions to the library continue to be made, there being now about 5,500 volumes in the care of the Society.

The CANADIAN RECORD OF SCIENCE keeps up its good record for scientific and general excellence, and, under the able editorship of Dr. Penhallow, it is hoped that it will appear at regular quarterly intervals, and make its way to the front as the standard scientific journal of the kind for the whole of Canada. To this end it is hoped that a grant from the Government, for which application has been made, will be re-established.

The annual Field Day was held at Mt. Johnson and was very successful. The attendance was very large and the arrangements for the comfort of the excursionists were well carried out.

In the report of last year reference was made to the interest in the question of the depredations of the Tus-

sock Moth on our shade trees. As a consequence of this crusade, measures, which unfortunately were only partially successful, were adopted, in conjunction with the civic authorities, to limit the ravages of this insect. As a result of our efforts, the dangers accruing from this pest have been more forcibly brought home to those most directly concerned, and this spring we expect that more vigorous measures will be adopted towards the extermination of the pest. As another example of the wide-reaching interest of the Society, may be mentioned the fact that attention was called to the wanton destruction of sea-gulls in the Lower St. Lawrence, and steps were taken to memorialize the Federal Government to inquire into the matter and to take the necessary steps to put a stop to the evil.

During the past year, the work of the Society has been hampered by the lack of sufficient and suitable accommodation for the prosecution of its distinctive work.

More especially has this been noticed in connection with the museum and library, a great amount of the material being inaccessible on account of the lack of the space to display it. In this connection, the Society has taken an important and decisive step in the direction of better things. It has disposed of the old building, which has so long been its home, and a scientific landmark in the city, and has acquired a most desirable site, consisting of about 10,000 square feet on the best portion of Drummond Street, where its temporary quarters have been located.

On this ground, it has been decided to erect a modern building, which will meet the increased requirements of the Society, and be a credit to the City of Montreal. To this end an influential and numerous building committee has been struck and immediate steps are to be taken to carry the Society's desires into effect. As a consequence of these changes, it has been found necessary to store the various specimens and books in suitable

places, so that for the coming year they will not be available for reference, and to this extent the Society's usefulness will be curtailed until the new home is an accomplished fact. Realizing this, and with the idea of in some measure compensating for it, the Society has decided to extend its work on the line of free public lectures to be given in different centres of the city and with the co-operation of the various bodies, like the Tuberculosis League, the Local Council of Women, the Pure Milk League, the Hygiene Committee, the Westmount School Commissioners, the Alexandra Hospital, and St. Paul's Hospital. The subjects that will be dealt with will include matters of hygiene, public health, decoration, materials and forms of construction, and will be dealt with in popular ways by competent lecturers. Some of the lectures are designed to meet the special requirements of artisans, and where necessary will be delivered both in English and French.

It is confidently expected that this number will be still more increased in view of the greater attractions which will be afforded by the increased facilities which it is hoped will be offered by the Society in the not very distant future. We have to regret the death of one of our members, that of the late Hon. R. Prefontaine.

The Society is greatly indebted to Mr. Alfred Griffin for his valuable and enthusiastic services placed at its disposal.

OFFICERS.

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Hon. Recording Secretary—F. W. Richards.
Hon. Corresponding Secretary—C. E. H. Phillips.
Hon. Treasurer—Chas. S. J. Phillips.
Hon. Curator—A. E. Norris.
Members of Council—J. A. U. Beaudry, C.E., Chairman; Prof. Jos. Bemrose, F.I.C., F.C.S.; J. H. Burland, Joseph Fortier, John Harper, F. McLennan, K.C.; Dr. A. G. Nicholls, Alex. Robertson, B.A.
Superintendent—Alfred Griffin.

REPORT TO ROYAL SOCIETY OF CANADA FOR THE YEAR 1906-7.

(By Prof. Nevil Norton Evans.)

The Natural History Society of Montreal is at present passing through a transition stage in its history, the old building on University Street, which it had occupied for so many years, having been sold and the new building not having been yet erected, leaving it for the time being without any proper home. The books, collections, and other effects of the Society have been packed up and stored away; a fine lot on Drummond Street near Sherbrooke Street has been purchased, and two old dwelling houses standing upon it serve as temporary, though very inadequate, quarters of the Society.

But the possession of such limited accommodation has by no means lessened the Society's activity. On the contrary, the temporary loss of its library, museum and other conveniences has stimulated it to increased effort along lines more or less independent of these accessories.

The regular monthly meetings have been held at the temporary quarters and, strange to say, the attendance has been much larger than during many years previous; unfortunately, on more than one occasion a great many people had to be turned away for lack of room, but the

general interest has grown rather than diminished. The subjects discussed have been as follows:

"Polar Rotation," by Mr. Chas. J. Stuart.

"A Visit to Some Mexican Volcanoes," Dr. F. D. Adams.

"Notes on Botanical Specimens Presented by Miss Bickley," by Dr. D. P. Penhallow.

"Infectious Diseases," by Dr. C. K. P. Henry.

"A Modern Scourge, Tuberculosis," by Dr. A. G. Nicholls.

"Bermuda, Historical and Geological," by J. S. Buchan, K.C.

"The Pulp Wood Industry of Canada," by Dr. D. P. Penhallow.

The Somerville Course of Free Lectures was held this year in the Assembly Hall of the Montreal High School, and drew large audiences. The list of subjects and lectures is here appended:

"Earthquakes," by Dr. F. D. Adams.

"Origin and Development of Certain Salt Marshes on the New England Coast," by Dr. D. P. Penhallow.

"The Ice Story of the St. Lawrence," by Dr. H. T. Barnes.

"Suspension of Life in Plants," by Prof. C. M. Derick, M.A.

"Dew," by Rev. I. J. Kavanagh, S.J., M.A., B.Sc.

The talks to children in the Assembly Hall of the Montreal High School, were, perhaps, not quite as well attended as in former years, when both before and after the talk the children roamed through the museum, and interesting specimens were pointed out and described; probably, too, the fact of the talks taking place in the new and unfamiliar building had much to do with keeping away certain of those little ones who were in the habit of coming with grown persons. But there is no doubt that when the public become acquainted with the new and greatly improved quarters which the society hopes soon to possess, renewed

interest in the work will be felt by the children quite as much as by any other section of the community. The work of the Society last winter in this particular branch is given below.

"Our Bird Neighbours," by R. H. Boehner, M.A.

"The Story of a Rain Drop," by J. A. Bancroft, M.A.

"Seeds and Fruits on Their Travels," by Prof. C. M. Derick, M.A.

"The Quest for Food," by Rev. I. J. Kavanagh, S.J., M.A., B.Sc.

"Flour," by J. S. Buchan, K.C.

An entirely new departure was made last season in inviting the co-operation of the Local Council of Women, The Canadian Handicrafts' Guild, The Tuberculosis League, The Pure Milk League, The Hygiene Committee, The Westmount School Commissioners, The Alexandra Hospital, The St. Paul's Hospital, The St. Lambert Literary Society, and the Grand Trunk Literary and Scientific Institute, and with their aid carrying out several courses of lectures to artisans, and delivering these—many in French as well as in English—as far as possible in such parts of the city as would be most convenient to those whom it was desired to reach. The lectures may be regarded as having fulfilled the object for which they were instituted, in the sense that they directed the attention of a large body of our citizens to questions of the highest importance and utility as having direct application to their daily occupations, in the improvement of the home life, and in a better understanding of correct hygienic conditions. The attendance upon the lectures and the characters of the audiences have been all that could have been expected, and another season of effort will be certain to bring yet more gratifying results. The following were the subjects offered:

"Lime, Plaster of Paris and Cements," by Prof. N. N. Evans, M.Sc.

"In the Chemistry Building, McGill University. Three lectures.

"Timber, Its Origin, Properties and Uses," by Dr. D. P. Penhallow, in the Peter Redpath Museum, McGill University. Four lectures.

"Tuberculosis," by Dr. A. G. Nicholls, in St. Luke's Church; Dr. C. N. Valin (in French), in Montcalm School; Dr. C. N. Valin (in French), in Sarsfield School.

"Infectious Diseases," by Dr. C. K. P. Henry, in Chalmers' Church; Dr. J. J. Ross, at the Grand Trunk Institute; Dr. C. C. Gurd, at St. Lambert.

"The Care of Children," by Dr. Ritchie England, in St. Mary's Hall; Dr. Ritchie England, at the Grand Trunk Institute.

"House Sanitation," by Rev. I. J. Kavanagh, S.J., M.A., B.Sc. (in English and French), at Sarsfield School.

"Civic Virtues," by G. W. Stephens, M.L.A., at the Grand Trunk Institute; G. W. Stephens, M.L.A., at Montcalm School.

"Furniture and Decoration," (with illustrations from the Handicrafts Shop), by Cecil Burgess, Esq., at St. Lambert; Dr. Stuart Nicol, at the Grand Trunk Institute; Prof. H. Armstrong, at St. Luke's Church; Mme. Rodier (in French), at Montcalm School; Mme. Rodier (in French), in Sarsfield School.

The Annual Field Day was held on Saturday, 2nd June, at St. Gabriel de Brandon, and a very large number of the members and their friends took the opportunity of visiting the little town so picturesquely situated among the Laurentian Hills on the shores of Lake Maskinonge.

The Society has continued to watch with vigilance the development of the Tussock Moth in the City of Montreal, and it is gratifying to observe that as a result of its endeavours there has been a marked abatement of the threatened damage to our shade trees. This has come through a greater activity and more careful attention on the part of the city authorities and an awakened

public interest, which has led property holders generally to exercise a more thorough care of their trees.

Provisional plans and estimates for a building worthy of the Institution and its work, and in keeping with the fine neighbourhood in which it is to stand, have already been made, and an active canvass of the friends of the Society is now going on. It is hoped that the whole of the money required for the building and its requirements will soon be raised, and that actual work thereon will be begun in the near future. With a home in every way adequate to the work which the Natural History Society feels it should be doing, in and for Montreal, we confidently look forward to entering upon a new lease of life replete with fresh zeal and courage.

Officers.

The officers of the Society are:

Patron—His Excellency the Governor-General of Canada.

Hon. President—Lord Strathcona and Mount Royal.

President—D. P. Penhallow, D.Sc., F.R.S.C.

Vice-Presidents—Frank D. Adams, Ph.D., F.R.S.C.; J. S. Buchan, K.C., B.C.L.; Rev. R. Campbell, D.D.; Miss Carrie M. Derick, M.A.; E. W. MacBride, M.A., Sc.D.; Wesley Mills, M.A., M.D.; Major G. W. Stephens, M.L.A.; Miss Van Horne; Hon. J. K. Ward.

Hon. Recording Secretary—Alex. Robertson, B.A.

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Members of Council—J. A. U. Beaudry, C.E.; Prof. Jos. Bemrose, F.I.C., F.C.S.; Joseph Fortier, John Harper, A. Holden, E. P. Lachapelle, M.D.; James Morgan, James W. Pyke, C. T. Williams.

Superintendent—Alfred Griffin.

* CENTENNIAL OF CHARLES DARWIN.

Of the many men born in the year 1809, none, not even Gladstone, has filled so large a place among men of learning and thought as Charles Darwin. It may be said without exaggeration that he is the greatest naturalist who has ever lived. Numerous societies, including his alma mater, the University of Cambridge, England, have held celebrations in his honour, and it is fitting that the Natural History Society of Montreal, the oldest organization in Canada for the prosecution of Natural Science, should have put in its proceedings some notice of the event. Darwin may be regarded as an illustration of his own theory of evolution. Heredity demonstrated its force in him, for was he not the grandson of Erasmus Darwin, author of several works bearing on Natural History, among others a whimsical one on the "Loves of the Plants," in which there were some hints looking in the direction in which his more famous grandson afterwards travelled? He was first destined by his father, who was a medical man, for his own profession, and afterwards for the ministry of the Church of England, but he did not feel himself drawn to either calling. He rather took up the subject of Natural Science, under the guidance of one of his professors, and he soon won distinction in his chosen line of work so that when captain, afterwards Admiral Fitzroy, wanted a naturalist to accompany him on the surveying voyage of the "Beagle," he was offered and accepted the position. In 1839, he published a journal of his researches on that voyage. This was followed, in successive years, by publications on the structure and distribution of Coral Reefs, Geological Observations on the Volcanic Islands visited, also notices of the Geology of Australia and the Cape of Good Hope and Geological Observations in

* Portion of a Somerville Lecture delivered by Dr. Robert Campbell, March 3rd, 1910.

South America, the "Geology of the Falklands," "The Formation of Mould," and a monograph of the Cirripedia. These publications, though following in the ordinary paths of Naturalists, contained many original suggestions. But it was his giving to the world his work on the "Origin of Species" which caused him all at once to spring into fame. This proved to be an epoch-making book. It is his monumental work on which his reputation largely rests. It has been well described by Alfred Russell Wallace, who issued about the same time a book suggesting the same theory, as displaying "untiring patience in accumulation, wonderful skill in using large masses of facts of the most varied kind, wide and accurate physiological knowledge, acuteness in devising and skill in carrying out experiments, and an admirable style of composition, clear and persuasive." This was a handsome tribute from a contemporary author who might, to a certain extent, be counted a rival. But it was in no wise exaggerated. The work has exerted an influence greater perhaps than any scientific volume that ever came from the press, Newton's "Principia" alone excepted. And its influence has not been confined to the realms of Natural Science. The theory which is pronounced, and which Herbert Spencer termed "evolution," went down to the bottom of things, and it has given a new direction to speculations in Physics, Psychology, Moral Philosophy, Biblical Criticism and Theology, as well as Politics. The value of this work does not depend on the correctness of his theory. It contains a compendious statement of well-sifted facts bearing on the life history of plants and animals; and it has given birth to an enormous and valuable literature, both *pro* and *con.*

Before entering upon a consideration of this, Darwin's most famous work, it is necessary to define what is understood by the term "species." It may be considered from a twofold point of view, Morphological and Physiological,—that is to say ,as regards anatomical

structure and form, in the one case, and as to the ability for individuals belonging to any group of organized beings to intermarry and produce a fertile offspring, in the other. Both considerations are to be kept in view in determining what is to be regarded as a species, but especially the latter point. It is found, for instance, that the male mule, which is a cross between the horse and the ass, cannot give birth to another mule. Plants, in like manner, may be crossed, but the hybrids thus produced are infertile. This is one of the mysteries of the realm of nature. How organized beings came to be thus divided up into groups, and surrounded by a wall of separation, was the problem which Darwin set himself to solve. The task he placed before himself was this: to show that all the various forms of vegetable and animal life with which the globe is now peopled, or of which we find the remains preserved in a fossil state in the great earth museum around us, have come down from at least four or five progenitors, animals and plants in an equal number. But his speculation did not stop at that point and he adds, "Analogy would lead me one step further, namely, to the belief that all animals and plants have descended from some one prototype and that probably all the organic beings which have ever lived on this earth have descended from some one primordial form into which life was first breathed by the Creator."

The main propositions by which he would bring us to that conclusion may be summed up, as follows:

(1) That observed and admitted variations spring up in the course of descent from a common progenitor. (2) That many of these variations tend to an improvement upon the parent stock, possessing some quality that is profitable or advantageous. (3) That by a continued selection of these improved specimens, as the progenitors of future stock, its powers may be increased illimitably. (4) That there is in nature a power continually and universally working out this selection and so fixing and

augmenting these improvements. His argument turns on the changes produced on domestic plants and animals.

These changes show at least that nature's productions are capable of being greatly modified by the interposition of man. The varieties in the pigeon family are made to do large service in Darwin's discussions; yet marked though the results in breeding, under man's oversight, have been in their case, they remain only varities because they freely breed between themselves and the male offspring is fertile, showing that he is not a hybrid. Indeed the reference to pigeons as well as cats and dogs may be turned against Darwin, for all these creatures entered into the menage of the ancient Egyptians 5900 years ago, as Antiquarians tell us. By this time one might expect that they should, through variation and the several influences Darwin rests on, have given rise to a new species. But aside from that the author of the "Origin of Species" has adroitly assumed that, because man has been able to make use of variations in domesticated organisms for his profit and advantage, such changes have been for the profit and advantage of the species thus domesticated, and that if they have profited under human selection why might they not in like manner profit by variation under the processes of nature?

Heredity is undoubtedly the most influential factor in the production and moulding of the forms of living things. The child takes after his parents, sometimes being more like his father and at other times more like his mother. He is indeed not an exact counterpart or reproduction of either, but there is generally noticeable a family likeness. What we now see is a circuitous course —the tree yielding fruit which in turn gives birth to a tree like itself; the egg laid by the bird hatching out a bird like the mother one. Thus there is a perpetual round. The question debated of old, whether the egg or the hen was first, has not yet been settled, but what is the order of procedure at present? We know that every

species gives birth to a reproduction of itself, with some measure of variation. Arguing from what is now the order regulating all life, we are justified in believing that it has been so since life first began upon the earth.

Heredity is a persistent fact, so far as our observation can carry us. But within the limits of species there is found an enormous measure of variation. Neither Darwin nor any one else has exaggerated this undoubted fact. We often hear the similes, as like as two blades of grass, or two peas; whereas no two blades of grass, or two leaves on a tree, or two peas, are seen to be alike when looked at through a powerful lens. Yet none of these variations are found to leap over the bars that fence them off from other species. It is a wonderful and curious fact that miscegenation is prohibited in the realms of life.

Mr. Darwin, indeed, starts out in his quest with correct ideas, speaking of the obvious objection, "that the term 'selection' implies conscious choice in the animals which become modified, and it has been urged that as plants have no volition natural selection is not applicable to them. In the literal sense of the word, no doubt, natural selection is a false term." Yet he frequently juggles with the word in the course of his narrative, and in his deductions from the facts he relates. And while he thus guards himself, at the outset of his constructive work, his unwary readers are led to treat literally what he, when challenged, only means figuratively. Further on he adds: "So again it is difficult to avoid personifying the word 'Nature,' but I mean by Nature only the aggregate action and product of many natural laws and by laws the sequence of events as ascertained by us." I do not charge him with any intentional unfairness or desire to mislead, but I take it that being so confident of the truth of his theory and so fully enamoured of it, he thought everything was to be interpreted in the light of it.

Darwin made free use of the observations and specu-

lations of previous students of Natural History, so far as they had any bearing on his quest. What is spoken of as the ladder of life had been frequently commented on,—the gradations of structure from simple forms, at the bottom, to complex ones at the top, as seen in living things, and of their relations to one another,—Algae, nearly allied to Lichens, Lichens to Fungi, Fungi to Hepaticae, Hepaticae to Mosses, Mosses to Ferns, and then the series of Phænogams, leading up to the Compositae.

Similarly animal life begins with the Amœba and ascends to man.

It has been observed before his day that large groups of species of widely different habits present the same fundamental plan of structure,—all the vertebrates, for instance,—and that parts of the same animal or plant, the functions of which are very different, likewise exhibit modifications of a common plan.

The existence of structures in a rudimentary and apparently useless condition, in one species of a group, which are fully developed and have definite functions in other species of the same group,—the flaps of seals and whales,—had been dwelt on. The modifications produced on living organisms when placed in new conditions, and the effects resulting from Geographic Distribution, were facts well known. And specially the revelations of palæontology, showing a succession of life, simpler in the older rocks, and more complicated as we examine the more recent formations, were highly suggestive. Familiar with all these facts, the enquiring mind of Darwin felt that the universe held in its bosom profound secrets which had not yet been brought to light, and he determined to fathom them so far as it was within the power of man to do so.

All his subsequent publications took their colour from his views as to the origin of species, and their general aim was to show the singular endowments possessed by plants and animals, in some regards equal to the

highest gifts bestowed upon man. Effects of cross-fertilization, in which the vegetable kingdom, the contrivances by which orchids are fertilized by insects—"Insectivorous plants"—"power of movements in plants," "Descent of man," and numerous monographs.

When confronted with the admitted fact that nature at present offers an insuperable bar to the mixing of species, so as to produce a fruitful offspring, he offered the following suggestion which has stuck in the ideas of his disciples, as if it were undoubtedly true: "That one existing animal has not been derived from any other existing animal, but that both are the descendants of a common ancestor which was at once different from either, but in essential characters intermediate between them both." He admitted that he could produce no such intermediate form, and also that the known facts of Geology were against the theory. These are his candid words: "Geology assuredly does not reveal any such finely graduated organic chain; and this is the most obvious and serious objection that can be urged against the theory. The explanation lies, as I believe, in the extreme imperfection of the geological record."

Darwin attempted to formulate a philosophy of life along certain lines, but it would not be correct to call him in early life an atheist.

"Agnostic" was the term invented by Huxley to represent the attitude of mind of the group of naturalists who accepted the theories I have outlined. Nor was their air of humility merely affected.

Speaking of the protoplasm, which is the primordial form of all life, Huxley defined it as "matter potentially alive and having within itself the tendency to assume a definite form"; and added, "what is the cause of this wonderful difference between the dead particle and the living particle of matter, appearing in other respects

identical? that difference to which we give the name of life? I, for one, cannot tell." Darwin did not eliminate Deity from the universe, even when he first propounded his theory. The closing sentence of his treatise on the "Origin of Species," summing up what he had advanced in it, is not unworthy of the great naturalist: "There is a grandure in this view of life, with its several powers, having been originally breathed by the Creator into a few forms, or into one, and that, whilst this planet has gone circling on according to the fixed law of gravity, from so simple a beginning, endless forms most beautiful and most wonderful have been and are being evolved." However, later in life he wrote as follows: "Disbelief crept over me at a very slow rate, but was at last complete. The rate was so slow that I felt no distress." An older philosophy of of the universe is that which dispenses with a Creator and Divine Ruler altogether. The Roman Poet Lucretius propounded it and it was championed by Robert Chambers in his "Vestiges of Breation," and found an eloquent exponent in Professor Tyndall, who, in his address at Belfast, when retiring from the presidency of the British Association, in 1874, declared that "matter has in it the promise and potency of all life." The theory of spontaneous generation, which Chambers championed, has been thoroughly exploded; but Professor Hæckel, of Germany, a well known monist who has gone far beyond Darwin, contends for the position that all atoms are living, and rejects everything which cannot be explained, including soul in man or God in Heaven. The theory of "Natural Selection" was thought by Darwin to be an important discovery, and it kindled in his mind such intense enthusiasm that he thought many things went to support that theory which a cooler, less impassioned observer could not regard in the same light. Only one in many cells generated matures, does it select itself? Do the others select not to mature?

There is the greatest need that terms used in this

discussion be clearly defined and then strictly adhered to. Let us begin with the word "Nature." Latin *natura* signifies the sum of all that has come to the birth and indicates the result of the forces at work in the universe; but it is quite improper to speak of it as if it were itself a force. Darwin indeed protests that he so understood the term; and if he used it otherwise it was only figuratively. Yet he constantly employed it as if it were a persistent agent, always and everywhere at work. And whatever reserve of meaning he retained in his own mind, when thus employing the word, there can be no doubt as to the significance put upon it by the larger portion of his readers. The term is constantly used in the loose sense. It has been pointed out how the phrases which Darwin made use of to indicate the method by which he conceived species to be generated, "Natural Selection," "Survival of the fittest," "Struggle for life," convey to the mind of the ordinary reader that the creature thus in issue is a sentient being, planning a course for itself and doing conscious battle on its own behalf. Darwin says he did not mean that, but he uses language and arguments as if he did, and certainly misleads his unthinking followers. "Law" is another word which is used loosely and made to do large service in the discussion of life's problems. Now, it, too, properly employed, only indicates the method in which force acts, it is not a force itself. It is usual to speak of the law of gravitation. But it is so employed to show how the force acts which we call gravitation, to conceal our ignorance, but it is not the acting force. The orbit in which the planets revolve around the sun, or the moon about the earth, is found to be mathematical, and Kepler calculated the facts in the case, and his calculations being found good by astronomical observers are called laws.

But they did not disclose the force by which the planets are guided in their courses. Are we to believe that the earth and the sun began their mutual career by

an agreement between themselves that they should maintain the mathematical relationship which, we observe, exists? We should be as fully justified in endowing them with a conscious personality, as Darwin was in ascribing to plants self-determination of their career, when he spoke of "Natural Selection."

So, too, the word "time" is made to play a large part in Darwin's theory. But here again the term is only an abstraction, signifying the succession of events and things, but not a force or agent. Yet Darwin speaks of 300,000,000 of years as able to yield all the diverse and complicated phenomena of life as it now exists and as it has existed in the several areas of which the rocks bear the records, all proceeding from a single protoplasmic cell. When he explains himself, he indeed tells us that he means that little changes in succeeding generations might, when put together in so prodigious a period, result in the great multitude of varied living things. Lord Kelvin, however, as great an authority in Physics as Darwin was in Natural History, and who has studied with care the facts adduced by Darwin in support of his theory, without being convinced by them, declared that the globe cannot possibly be more than 20,000,000 years old. This conclusion he arrived at by calculating how long it must have taken the earth to have cooled to its present condition from its primeval molten state. Be that as it may, it is enough to say that if changes, even the slightest, have not been observed looking to the formation of new species since men began to take cognizance of life as it now is on our planet, the mere multiplying of eras cannot be supposed to secure results. The multiplying of nothing by infinity would still yield nothing.

It was one of Darwin's theories that the varieties which are ever and anon appearing among the ordinary forms of species might have a better chance, those of them that the surroundings favoured, than the typical specimens, and thus new species might be gradually formed. But since he thus speculated, the good monk,

Mendel, discovered a principle bearing upon this point, which wholly confutes Darwin's notion. The force of heredity is shown by innumerable experiments and observations to be persistent, so that accidental variations have no chance to compete with the ordinary form of a species.

Since Darwin's day, too, Jean Henri Fabre, the great French entomologist, predisposed to Darwinism, has shown, however, that insects are not able to plan for themselves or acquire new ways by experience, but obey a blind impulse, having no power to adapt themselves to unlooked for situations.

Then, there is a question which has never been answered by the evolutionists: If it is a law of all life to be ever moving towards something higher, how is it that further development has ceased at man? The latest estimate made by people calling themselves scientific, of the period of his existence upon the earth is 20,000,000 of years—only a wild guess. Surely, by this time, assuming the correctness of the guess, there should be some tokens of the acquisition of wings or some other sign of his rising a step higher in the scale.

Except Hæckel and Wallace, the latter holding the same theory, although somewhat modified, the men of science of this day has given up the notion that species have formed themselves by any inner potentiality or plans of their own, however the selection, which is a fact, is to be accounted for.

CONTRIBUTIONS TO CANADIAN PALÆONTOLOGY.

"The Manus in a Specimen of Trachodon, from the Edmonton Formation of Alberta."

"A New Genius and Species of Ceratopsia, from the Belly River Formation of Alberta."

"On the Fore-Limb of a Carnivorous Dinosaur, from the Belly River Formation of Alberta, and a New Genus of Ceratopsia, from the Same Horizon, with Remarks on

the Integument of Some Cretaceous Herbivorous Dinosaurs."

"On Gryposaurus Notabilis, a New Genus and Species of Trachodont Dinosaur, from the Belly River Formation of Alberta, with a Description of the Skull of Chasmosaurus Belli."*

By Lawrence M. Lambe, F.G.S., F.R.S.C., F.G.S.A., Vertebrate Palæontologist to the Geological Survey.

The Geological Survey of Canada has continued for many years now its explorations in the rocks along the Red Deer River and in the Valley of the Belly River, Alberta, with most encouraging results. Rich rewards have been reaped in the shape of rare fossils, and these have afforded scope for the application of the skill of Mr. Lambe, the expert Vertebrate Palæontologist of the Department. He has greatly added to his already well-established reputation by these last contributions to fossil lore. The remains of new monsters of the Saurian type are brought to light in the above series of interesting papers, which have appeared in *The Ottawa Naturalist*, Vol XXVII, May and December, 1813, January and February, 1914, from which brief extracts are here offered.

The first of the papers has particular reference to the osteology of the front feet, or hands, of a specimen of Trachodon discovered last summer in the Edmonton formation (Upper Cretaceous) or Red Deer River, Alberta, by the Geological Survey-Vertebrate Palæontological field party, under Charles H. Sternberg. This specimen is now being mounted in high relief preparatory to being placed on exhibition in the Museum of the Geological Survey, Ottawa. The skeleton of this Trachodon is almost complete from the front magin of the snout to the sixth caudal vertebra, but the remainder of the tail is missing. This defect, however, can be remedied to a great extent in mounting the specimen, as fortunately a

* Communicated by permission of the Director of the Geological Survey.

large portion of the tail of another individual of similar size was found at the same locality, and can be used to take the place of the missing vertebra.

"The specimen is in an excellent state of preservation as a whole, and is one of the most complete of the skeletons of Trachodon mounted in the museums of this continent."

Styracosaurus, gen. nov.

Styracosaurus Albertensis, sp. nov. is described in the second paper: "The skull of this species is remarkable for the largeness of the nasal horn-core, the remoteness of the same from the acute rostral apex, and for the great development of backwardly directed spike-shaped processes on the posterior margin of the coalesced parietals.

"The name selected for this genus has reference to the shape of the large processes on the frill, which resembles spikes, and must have made this bristling reptile in life a veritable moving *chevaux de frise*.

"This specimen brings to light an entirely new phase of frill development which is unique among the horned dinosaurs. It may be regarded as one of the most complete and best preserved of the Ceratopsian skulls hitherto discovered in Cretaceous deposits of this continent."

Referring to the contents of the third paper, it is remarked: "An unusually perfect skeleton of a carnivorous dinosaur, lately added to the collection of the Geological Survey, is of special interest on account of the preservation in it of one of the front legs. The specimen * * * * forms part of the very large collection of reptilian and other remains made last summer by the Vertebrate Palæontoligical party, which explored the rich dinosaur beds below Berry Creek.

"The structure of the fore-limb in the large carnivorous dinosaurs of the Cretaceous has been to a great extent conjectural. In this new specimen the right limb is preserved, and it is hoped that the left one will be re-

vealed, as the work of removing the sandstone matrix proceeds. The discoverer of this splendid speciment was Charles Sternberg, Jr., who was one of the Vertebrate Palæontological field party of 1913."

PROTOROSAURUS, GEN. NOV.

"This genus is proposed for the reception of the Belly River Cretaceous ceratopsian species, originally described by the writer under the name *Monoclonius Belli*.

"It is now evident that this Belly River form is generically distinct from both Monoclonius, Cape and Ceratops Marsh, and that its affinities are with Torosaurus Marsh, to which it apparently leads in a direct line of descent, and from which it differs by well-marked primitive characters.

"With the skeleton of *P. Belli* were found well preserved impressions of the integument, of the same general character as that of the Trachodonts."

The last of the four papers describes "a skull representing a new genus and species of Trachodont, and of that of *Chasmosaurus belli*, both forming part of last summer's collection.

"The skull of the Trachodont is remarkable for its splendid state of preservation. The elements composing it are singularly free from breaks and displacement. There is little or no discoloration, and the specimen is as close an approach to perfection as can be expected in a fossil vertebrate of large size.

"For the genus and species represented the name *Gryposaurus notabilis* is proposed, the generic name having reference to one of the most striking features of the skull, viz., the prominence attained by the upper marginal curve of the nasal bones.

"The discoverer of these remains was George F. Sternberg."

ABSTRACT FOR THE MONTH OF JANUARY, 1914.

Meteorological Observations, Taken at McGill College Observatory. Height above sea-level, 187 feet. C. H. McLEOD, *Superintendent.*

DAYS.	THERMOMETER				*BAROMETER				‡ Mean relative humidity.	WIND		Per cent. of possible Sunshine	Rainfall in inches.	Snowfall in inches.	Rain and snow melted.	DAYS.
	† Mean.	Max.	Min.	Range.	† Mean.	Max.	Min.	Range.		General direction.	Mean velocity in miles per hour					
1	-0.2	6.9	-5.0	11.9	30.32	30.37	30.27	.10	64	E	11.0	85	...	...	...	1
2	5.5	12.6	-2.8	15.4	30.28	30.32	30.26	.06	70	NE	9.0	58	...	...	...	2
3	19.4	25.0	12.4	12.6	30.18	30.27	30.08	.19	66	NE	11.4	32	...	...	...	3
SUNDAY....4	24.1	28.9	19.9	9.0	30.03	30.07	29.98	.09	66	NE	25.4	0	...	...	...	4....SUNDAY
5	16.0	21.8	11.7	10.1	30.17	30.20	30.08	.12	63	NE	18.6	94	...	...	...	5
6	13.1	21.5	6.2	15.3	30.03	30.20	29.75	.45	70	SW	10.4	51	.01	...	.01	6
7	27.7	30.9	23.7	7.2	29.64	29.71	29.58	.13	78	NW	12.4	0	.02	0.5	.05	7
8	19.8	24.8	17.0	7.8	29.61	29.66	29.55	.11	72	NE	9.2	0	...	0.6	.03	8
9	19.6	21.9	17.1	4.8	29.38	29.54	29.17	.37	84	NE	9.3	0	T	1.0	.24	9
10	18.7	24.0	7.2	16.8	29.47	29.82	29.15	.67	77	NW	8.5	13	...	1.5	.15	10
SUNDAY....11	0.2	7.7	-7.5	15.2	29.94	30.04	29.74	.30	63	W	16.6	91	...	0.5	.02	11....SUNDAY
12	3.8	18.4	-15.0	33.4	29.58	29.92	29.27	.65	73	NW	24.0	1	...	8.0	.80	12
13	-22.9	-15.0	-27.1	12.1	30.26	30.43	30.07	.36	56	W	23.6	65	...	...	...	13
14	-16.9	-8.1	-25.4	17.3	30.45	30.57	30.21	.36	53	W	17.6	85	...	...	...	14
15	-1.1	8.9	-8.6	17.5	29.98	30.17	29.87	.30	73	NE	10.4	0	...	0.1	.01	15
16	14.0	20.3	8.9	11.4	29.75	29.88	29.65	.23	80	SE	7.6	0	...	0.1	.01	16
17	19.5	23.3	9.7	13.6	29.86	30.13	29.64	.49	67	NE	18.5	0	...	T	T	17
SUNDAY....18	3.9	9.7	-0.4	10.1	30.24	30.34	30.12	.22	57	W	16.8	88	...	...	...	18....SUNDAY
19	17.6	26.3	5.0	21.3	29.80	30.08	29.62	.46	77	W	17.2	0	...	2.3	.13	19
20	8.4	25.0	5.0	20.0	29.79	29.86	29.68	.18	68	NE	18.3	60	...	T	T	20
21	6.3	8.9	3.7	5.2	29.50	29.70	29.33	.37	77	N	19.8	0	...	7.0	.70	21
22	-0.1	3.7	-5.3	9.0	30.05	30.21	29.82	.39	63	W	19.1	88	...	...	...	22
23	15.1	31.3	-3.3	34.6	30.04	30.26	29.70	.56	71	SW	15.7	12	.01	...	.01	23
24	34.4	39.0	26.0	13.0	29.54	29.63	29.43	.20	83	W	19.1	0	.72	1.2	.79	24
SUNDAY....25	4.4	26.0	-4.6	30.6	29.94	30.28	29.47	.81	55	NW	19.0	93	...	...	...	25....SUNDAY
26	0.6	4.0	-5.0	9.0	30.31	30.36	30.26	.10	73	NE	10.3	0	...	1.0	.10	26
27	24.0	36.0	1.7	34.3	30.04	30.33	29.93	.40	81	SW	13.8	0	.01	0.4	.08	27
28	29.1	35.0	24.3	10.7	30.28	30.53	29.97	.56	79	NE	11.2	15	.34	1.0	.44	28
29	32.5	39.3	21.4	17.9	30.13	30.48	29.83	.65	77	SW	20.4	48	...	...	...	29
30	33.0	43.6	21.9	21.7	29.99	30.31	29.78	.53	57	NW	30.2	85	...	...	...	30
31	11.7	21.9	5.8	16.1	29.98	30.36	29.43	.93	67	NE	18.8	0	...	6.0	.70	31
Means.....	12.29	20.1	4.3	15.8	29.955	30.130	29.764	.366	69.66		15.92	34.26	1.11	31.2	4.27	.....Sums
40 Years means for and including this month.	12.66	29.90	4.72	16.17	30.049	.....	.....	.347	81.39		15.80	32.17¶	0.872	29.78	3.75	40 Years means for and including this month.

ANALYSIS OF WIND RECORD.

	N	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	CALMS
Direction.....									
Miles.....	588	3861	708	304	540	1474	2239	2070	
Duration in hours...	37	253	72	33	35	80	119	112	3
Mean Velocity.....	15.9	15.2	9.8	9.2	15.4	19.6	19.3	18.5	

The greatest mileage in one hour was 41 on the 30th.
The greatest velocity in gusts was 65 on the 30th Total mileage, 11844. Resultant direction, N21°10'W. Resultant mileage, 3190.

The greatest heat was 43.6° above zero on the 30th. The greatest cold was 27.1 below zero on the 13th, giving a range of 70.7°.

The warmest day was the 24th. The coldest day was the 13th.

The highest barometer reading was 30.53 on the 28th. The lowest barometer reading was 29.15 on the 10th, giving a range of 1.38 inches.

The minimum relative humidity observed was 33 on the 14th.

Fog on 1 day.

Hail on 1 day.

Lunar halos observed on 2 nights.

* Barometer readings reduced to sea-level and temperature 32° Fahrenheit

† Mean of bi-hourly readings taken from self-recording instruments.

‡ Humidity relative, saturation being 100. Mean of readings taken every four hours from self-recording hygrometer.

¶ 33 years means.

§ 27 years means.

ABSTRACT FOR THE MONTH OF FEBRUARY, 1914.

Meteorological Observations, Taken at McGill College Observatory. Height above sea-level, 187 feet. C. H. McLEOD, *Superintendent.*

DAYS.	THERMOMETER				*BAROMETER				‡ Mean relative humidity.	WIND		Per cent. of possible Sunshine	Rainfall in inches.	Snowfall in inches.	Rain and snow melted.	DAYS.
	† Mean.	Max.	Min.	Range.	† Mean.	Max.	Min.	Range.		General direction.	Mean velocity in miles per hour					
SUNDAY.....1	19.3	25.1	12.7	12.4	29.68	30.01	29.42	.59	74	NW	25.1	51	...	0.7	.06	1.....SUNDAY
2	17.9	23.1	11.5	11.6	30.44	30.61	30.07	.54	59	NW	14.7	91	...	T	T	2
3	26.5	39.8	7.2	32.6	30.12	30.46	30.04	.42	74	SW	15.2	9	...	1.0	.08	3
4	29.4	37.0	13.6	23.4	29.93	30.17	29.75	.42	66	NW	18.3	64	.07	T	.07	4
5	8.1	13.6	3.7	9.9	30.28	30.44	30.17	.27	61	NW	9.9	74	...	...	...	5
6	7.4	19.6	-3.3	22.9	30.30	30.52	29.87	.65	71	E	14.0	77	...	4.2	.47	6
7	22.3	35.0	12.9	22.1	29.33	29.75	29.14	.61	74	SW	23.8	14	.01	2.2	.35	7
SUNDAY.....8	3.7	12.9	-1.3	14.2	29.83	29.97	29.54	.43	56	W	21.0	82	...	T	T	8.....SUNDAY
9	8.1	15.0	0.7	14.3	30.14	30.24	30.03	.21	61	W	16.0	81	...	0.2	.02	9
10	-0.7	9.8	-12.3	22.1	30.30	30.42	30.09	.33	49	NW	14.9	89	...	...	...	10
11	-19.8	-12.3	-26.9	14.6	30.42	30.46	30.36	.10	49	NE	14.0	89	...	...	...	11
12	-18.6	-12.0	-25.5	13.5	30.58	30.73	30.45	.28	56	NW	22.0	90	...	...	...	12
13	-8.5	-4.2	-15.7	11.5	30.66	30.81	30.33	.48	64	E	8.6	30	...	...	...	13
14	1.7	12.3	-8.0	20.3	29.92	30.29	29.62	.67	63	NE	12.7	0	...	3.5	.35	14
SUNDAY.....15	-2.5	6.1	-7.0	13.1	29.99	30.07	29.83	.24	55	W	17.4	88	...	...	...	15.....SUNDAY
16	-4.2	0.0	-10.0	10.0	29.91	30.04	29.84	.20	66	NE	9.9	63	...	T	T	16
17	2.6	5.9	-4.3	10.2	29.96	30.02	29.88	.14	61	W	14.6	97	...	...	...	17
18	6.5	11.1	-0.2	11.3	30.10	30.18	30.03	.15	65	SW	6.0	69	...	T	T	18
19	7.0	14.9	-2.0	16.9	30.04	30.12	29.98	.14	59	NE	10.8	51	...	...	...	19
20	-0.8	8.8	-5.5	14.3	30.35	30.45	30.24	.21	49	NE	11.6	88	...	...	...	20
21	-1.9	3.2	-7.7	10.9	30.22	30.30	29.[illegible]	.38	56	NE	10.4	88	...	...	...	21
SUNDAY.....22	10.8	24.6	0.0	24.6	29.82	30.14	29.59	.55	61	W	18.4	51	...	2.8	.20	22.....SUNDAY
23	-4.4	1.4	-9.9	11.3	30.37	30.44	30.23	.21	49	NW	14.7	97	...	...	...	23
24	-2.8	2.3	-9.5	11.8	30.51	30.56	30.48	.08	52	W	15.4	91	...	T	T	24
25	10.6	21.6	-3.9	25.5	30.39	30.53	30.22	.31	64	W	23.0	48	...	T	T	25
26	24.4	30.8	18.0	12.8	30.13	30.21	30.03	.18	64	W	17.5	16	...	0.1	.01	26
27	31.6	36.3	27.6	8.7	30.01	30.05	29.98	.07	68	W	20.8	40	...	0 2	.02	27
28	33.8	40.6	24.5	16.1	29.83	29.97	29.63	.34	62	SW	17.4	79	...	...	...	28
Means.....	7.41	15.1	-0.7	15.8	30.127	30.284	29.956	.329	61.04		15.76	64.57	.08	14.9	1.65	.....Sums
40 Years means for and including this month.	14.690	22.652	6.739	15.717	30.021	.....	.....	.317	79.26		17.35§	40.40¶	7.61	25.11	3.248	40 Years means for and including this month.

ANALYSIS OF WIND RECORD.

Direction.....	N	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	CALMS
Miles.....	489	1097	453	183	276	1004	4305	2784	
Duration in hours...	50	97	39	21	22	59	235	148	1
Mean Velocity.....	9.8	11.3	11.6	8.7	12.6	17.0	18.3	18.8	

The greatest mileage in one hour was 44 on the 7th.
The greatest velocity in gusts was 70 on the 7th. Total mileage, 10591. Resultant direction, N69°21'W. Resultant mileage, 6023.

The greatest heat was 40.6° above zero on the 28th. The greatest cold was 26.9° below zero on the 11th, giving a range of 67.5°.

The warmest day was the 28th. The coldest day was the 11th.

The highest barometer reading was 30.81 on the 13th. The lowest barometer reading was 29.14 on the 27th, giving a range of 1.67 inches.

The minimum relative humidity observed was 41 on the 10th.

Fog on 2 days.

Lunar halos on 1 night.

Earthquake lasting about 1 minute at 1.30 p.m., on the 10th.

* Barometer readings reduced to sea-level and temperature 32° Fahrenheit

† Mean of bi-hourly readings taken from self-recording instruments.

‡ Humidity relative, saturation being 100. Mean of readings taken every four hours from self-recording hygrometer.

¶ 33 years means.

§ 27 years means.

ABSTRACT FOR THE MONTH OF MARCH, 1914.

Meteorological Observations, Taken at McGill College Observatory. Height above sea-level, 187 feet. C. H. McLEOD, *Superintendent.*

DAYS.	THERMOMETER				*BAROMETER				† Mean relative humidity.	WIND		Per cent. of possible Sunshine	Rainfall in inches.	Snowfall in inches.	Rain and snow melted.	DAYS.
	† Mean.	Max.	Min.	Range.	† Mean.	Max.	Min.	Range.		General direction.	Mean velocity in miles per hour					
SUNDAY 1	33.4	35.4	32.3	3.1	29.37	29.59	29.02	.57	73	NE	21.5	0	.10	3.4	.64	1 ..... SUNDAY
2	34.6	36.3	31.6	4.7	29.28	29.47	29.02	.45	83	NE	31.6	0	.20	1.4	.44	2
3	37.0	44.9	31.4	13.5	29.57	29.63	29.52	.11	66	N	17.2	60	.04	...	.04	3
4	25.6	31.4	22.1	9.3	29.72	29.81	29.65	.16	74	W	19.1	1	...	1.3	.06	4
5	23.4	29.0	17.5	11.5	30.04	30.15	29.86	.29	68	W	12.9	96	...	0.1	.01	5
6	26.1	35.0	15.9	19.1	30.02	30.11	29.88	.23	74	NE	16.3	32	...	1.2	.12	6
7	28.4	31.0	26.9	4.1	29.63	29.80	29.57	.23	83	E	12.4	0	...	3.7	.39	7
SUNDAY 8	24.7	30.9	17.5	12.5	29.59	29.70	29.54	.16	77	W	18.0	38	...	0 7	.06	8 ..... SUNDAY
9	16.9	21.2	12.5	8.7	29.75	29.88	29.69	.19	70	W	16.0	48	...	.03	.03	9
10	15.0	19.6	10.2	9.4	30.00	30.08	29.90	.18	61	W	17.8	64	...	...	...	10
11	16.7	20.6	12.2	8.4	30.14	30.19	30.08	.11	59	NW	17.8	80	...	...	...	11
12	16.3	21.3	7.3	14.0	30.15	30.22	30.06	.16	49	W	14.4	87	...	...	...	12
13	22.1	29.9	12.8	17.1	30.11	30.21	30.01	.20	33	W	14.6	83	...	...	...	13
14	26.1	33.0	16.7	16.3	30.00	30.19	29.82	.37	75	SW	18.8	0	...	2.6	.32	14
SUNDAY 15	32.2	38.0	27.7	10.3	30.07	30.18	29.86	.32	68	NE	8.9	80	T	T	.01	15 ..... SUNDAY
16	38.4	43.6	28.4	15.2	29.91	30.11	29.71	.40	67	SW	21.7	1	.01	...	.01	16
17	37.5	41.5	32.3	9.2	29.93	29.94	29.89	.05	61	W	18.8	73	...	...	...	17
18	33.6	40.3	31.1	9.2	29.70	29.87	29.49	.38	72	SE	17.4	0	...	5.7	.54	18
19	18.1	32.2	12.1	20.1	29.76	30.02	29.49	.53	73	NW	32.2	30	...	1.2	.12	19
20	7.5	12.1	1.9	10.2	30.15	30.26	30.03	.23	52	W	23.0	97	...	...	...	20
21	16.2	24.3	7.2	17.1	30.29	30.37	30.21	.16	51	W	20.0	93	...	...	...	21
SUNDAY 22	25.7	31.6	19.7	11.9	29.98	30.17	29.82	.35	65	W	12.7	63	...	0.2	.01	22 ..... SUNDAY
23	20.0	24.1	14.3	9.8	29.96	30.09	29.85	.24	60	NE	7.7	44	...	T	T	23
24	26.6	32.1	18.1	14.0	30.27	30.41	30.13	.28	45	W	8.6	68	...	...	...	24
25	34.2	42.9	22.0	20.9	30.34	30.49	30.14	.35	62	S	16.0	76	T	...	T	25
26	44.0	49.8	38.3	11.5	30.10	30.15	30.03	.12	70	W	21.4	76	.02	...	.02	26
27	39.8	43.9	36.9	7.0	30.16	30.30	30.01	.29	73	NE	11.3	0	.02	...	.02	27
28	31.4	36.9	26.0	10.9	30.36	30 40	30.31	.09	58	NE	23.2	81	...	...	...	28
SUNDAY 29	32.3	37.7	25.6	12.1	30.38	30.44	30.29	.15	66	NE	9.1	0	...	...	...	29 ..... SUNDAY
30	33.9	37.1	32.0	5.1	30.15	30.25	30.06	.19	63	NE	15.4	0	.05	1.2	.26	30
31	33.6	38.6	29.1	9.5	30.43	30.51	30.26	.25	58	W	11.7	95	...	...	...	31
Means	27.46	33.07	21.60	11.47	29.979	30.096	29.845	.251	67.01		17.02	47.5	.44	23.0	3.10	..... Sums
40 Years means for and including this month.	25.24	32.15	17.90	14.25	29.986	.....	.....	.287	70.70		17.031§	44.3¶	1.47	21.4	3.77	40 Years means for and including this month.

ANALYSIS OF WIND RECORD.

Direction	N	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	CALMS
Miles	545	2928	304	183	773	1260	4759	1910	
Duration in hours...	36	155	25	17	53	69	281	98	7
Mean Velocity	15.1	18.9	10.9	10.8	14.6	18.3	16.9	19.5	

The greatest mileage in one hour was 45 on the 19th.
The greatest velocity in gusts was 66 on the 19th. Total mileage, 12562. Resultant direction, N63°W.
Resultant mileage, 4972.

The greatest heat was 49.8° above zero on the 26th. The greatest cold was 1.9° below zero on the 20th, giving a range of 47.9°.

The warmest day was the 26th. The coldest day was the 20th.

The highest barometer reading was 30.51 on the 31st. The lowest barometer reading was 29.02 on the 1st, giving a range of 1.49 inches.

The minimum relative humidity observed was 38 on the 31st.

Fog on 4 days.

Hail on 1 day.

* Barometer readings reduced to sea-level and temperature 32° Fahrenheit.

Mean of bi-hourly readings taken from self-recording instruments.

Humidity relative, saturation being 100. Mean of readings taken every four hours from self-recording hygrometer.

¶ 33 years means.

§ 28 years means.