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NOTICE.—The Treasurer begs to call the attention of members to he advertisements.

MONDAY AFTERNOON POPULAR LECTURES.

ZOOLOGY.

IDEAS ON THE BEGINNING OF LIFE.

By J. Ballantyne.

(Read February 10, 1890.)

Organic life, as you all know, is arranged by naturalists into two great divisions, named respectively the vegetable and animal kingdoms, the last named of which being the subject matter of this paper.

To the ordinary observer the difference between plants and animals can be seen at once, as only the higher or more specialised forms are compared, but with the naturalist, who digs down into the lower forms of life, distinctions all but disappear, so that he finds it impossible to fix the point where the diverging lines of life really begin, or to say whether vegetable or animal life had precedence in the order of their beginning in the far distant past. Dr. Andrew Wilson, of Edinburgh, in his work "Chapters on Evolution," says: "In the lowest deeps of plant life we may discover organisms which possess at the best a doubtful title to be regarded as objects of botanical study. In the animal world, likewise, are included lower organisms which may be regarded in certain aspects as possessing true relationship with plants. Modern biology to-day frankly admits its inability to pronounce whether certain lowest forms of life are animals or plants, certain 'monads,' for example, consisting each of a speck of protoplasm provided with microscopic whip-tails, exhibit a highly confusing identity of structure and function, which renders their exact nature indeterminable, or at least highly doubtful. Hence we discover that apparently at the lowest confines of the animal and plant realms, we enter a biological 'no man's land,' whereof the included inhabitants may legitimately claim relationship with both kingdoms. They exhibit in this latter respect, in the eyes of biologists, the actual survivals of that early epoch in the history of life's development when the specialized kingdoms of animals and plants were not, and when existence passed placidly along the common lines which were soon to diverge into two great series of living beings that environ our footsteps to-day."

Zoology in its widest sense may aim at a full and complete knowledge of animal life, from the simple cell of the lowest protozoon to that of the most complex or differentiated structure in existence. It may not only be a knowledge of animal life as it now exists, with its almost infinite number of variations and complexities, but it may extend its researches away back for countless ages and inquire into their origin or beginning—inquire from whence they came and whither they are tending. Truly a vast subject.

In the ordinary study of animal life the various kinds are grouped together in a certain order. The number of the different sorts of animals being very great—much greater than that of plants—and the diversity among them also being greater, a division of the same into branches relating to different groups may naturally take place, as without an arrangement of this kind it would be almost impossible to describe an animal in such a way as to enable the student to find very readily any particular animal described. This method of grouping animals together is somewhat as follows: Supposing we take up that branch of zoology which has for its subject bird life, or ornithology—(*ornis* a bird, *logos* a discourse). The first step in classification would be to ascertain some peculiarity common to all animals which go by the name of bird. It would occur to most of us at once that all birds have feathers, and that no other animal is similarly clothed. This one characteristic would be sufficient to determine a bird's place among animals. Having got this far, it would very soon be perceived that structural differences, particularly in the feet, existed among birds, some having three toes, some four, some with three in front and one behind, some with two in front and two behind, others again with three in front only, some with their toes joined together with a thin skinny web, and several other points of difference. It would be quite natural to begin classification by grouping together all the birds having the same kind of feet. We would not think of placing a bird with feet adapted for perching in the same group with those with feet adapted for swimming. We would soon have several large orders of birds arranged by their feet peculiarities; but this grouping would not be sufficiently definite, as many birds with feet somewhat alike are very different in other respects; so that in order to designate any particular bird with certainty

these orders would require to be subdivided a good many times, always selecting those which have most things in common, and grouping them by themselves. By narrowing down in this way it is comparatively easy to find out the name of any bird from the descriptions usually given in works on ornithology. In like manner in all the other divisions into which animal life is arranged, classification is carried out. The necessity for classifying the different sorts of animals into such groups as I have tried to point out must be so apparent to all that there need be nothing further said on the subject.

The study of the various forms of animal life with all their never ending peculiatities, their relations to each other—their habits and instincts, &c., must always be of great interest to man, but that branch of scientific research, which takes for its subject the origin of life, together with the origin of species, opens up fields of speculation of much greater interest, and which bid fair to revolutionize our whole conception of the manner in which man as well as all other organisms came to be as we now find them.

It is my purpose to try and point out as briefly and as clearly as I can some of the views held by leading scientists of the present day on the subject just named. Up to a very recent period the belief was all but universal that all living creatures came from the hands of their creator perfectly formed and perfectly fitted to the surrounding world in which they had their habitation, that a power outside and beyond what we call nature brought life into existence from nothing, and that it was so continued in the same unchanged and unchangable condition throughout all the time of its existence. It was claimed that God had infallibly revealed to man the order and plan of creation, and consequently there was no room for discussing or inquiring into the subject at all. The few people who had the timerity to doubt the finality of the biblical conclusions, as then understood, suffered no little in the way social and physical persecution.

The investigation of nature, principally during the past half century, has not only shaken the belief in the theological explanation of the world and of life, but has given rise to new theories concerning the beginning of life and the causes accounting for all its varied forms.

As the structure and make up of the earth came to be investigated

there were found, as Mr. Billings told us a few evenings ago, the imprint or remains of figures in the rocks which strongly resembled the organic structure of plants and animals. To account for these apparent remnants of life, various conjectures were advanced, the one most generally acceptable among theologians for a time being the great flood of Noah as recorded in the Book of Genesis, which was a sufficient explanation, and the organic remains found in the rocks bore testimony to the fact that such a great deluge had really taken place. As the work of geological investigation proceeded it soon became evident that the generally conceived idea of creation, as found in the Mosaic records was not in accordance with facts, and that a different interpretation was necessary in order to reconcile the apparently conflicting records, one of the difficulties being the existence of organic remains so deeply embedded in the rocks, that it was utterly impossible to conceive how they could have been placed in such a position in the short period of six days, or how a temporary flood existing less than one year could bring about such tremendous changes in the surface of the earth.

Hugh Miller, the Scotch geologist, in his work entitled the "Testimony of the Rocks," written about forty years ago, makes an attempt to reconcile the geology of the Pentateuch with the geology of nature by the hypothesis, that the days mentioned in the first chapter of the book of Genesis do not represent the actual duration of the successive periods of creation, but only the time occupied by God in unrolling a panoramic vision of these periods before the eyes of Moses on the Mount. Another form of reconciliation advanced and very generally accepted by believers in the scientific accuracy of the Mosaic records, and which it is maintained the original text fully warrants, is that the days mentioned in the book of Genesis were not days of twenty-four hours each, and that the Hebrew word translated into the word day in our common English version of the Bible is used in other places to signify a period of time which might be indefinitely prolonged.

The Hon. W. E. Gladstone very recently undertook to show that the order of creation as recorded by Moses was in complete harmony with the order recorded in the rocks and that there was no conflict between religion and science. He attempts to show that there were four periods of time in which all organic life appeared upon the earth, and

that the order in which geology tells how they came, was in no way different from that told by Moses. The four periods were as follows:—First, a period in which all vegetable life came into being; second, a period in which aquatic or water-living animals appeared, and third, a period in which fowls of the air and all winged animals began to exist, and fourth, a period in which earth and land animals appeared with man as head over all.

Mr. Thos. Huxley, in reply, maintains that the testimony of the rocks does not warrant a belief in any distinctive periods in which plants and animals first made their appearance, but appears to think that the lower forms of life, whether of plants or of animals, came into existence about the same time. In that school of scientists who have accepted the general theory of evolution as sufficient to account for all the varied and ever changing forms of life, it is held that the beginning of life itself was simply a phase of matter, and was no more mysterious, and no more called for supernatural interference than the chemical combinations continually taking place round about us. I think I cannot do better than give a few quotations from "Evolution and the Origin of Life," by Professor H. C. Bastian, of University College, London, England. He very clearly states the case from an evolutionist point of view, and as clearly gives the reasons why he believes the general theory to be true. I can only give short quotations here and there, which you all know cannot do justice to any writer. In defining what the word implies he says: "Evolution implies continuity and uniformity. It teaches us to look upon events of all kinds as the products of continuously operating causes; it recognizes no sudden breaks or causeless stoppages in the sequence of natural phenomena. It equally implies that natural events do not vary spontaneously. It seeks to assure us that the properties and tendencies now manifest in our surrounding world of things are in all respects similar to those which existed in the past. Without a basis of this kind Evolution would be a mere idle dream." An examination of the facts of science generally, and of various every day phenomena, teaches us, according to the evolutionist, that matter of different kinds, situated as it is and has been, gradually tends within certain limits to become more and more complex in its internal and external constitution, Coupling this conclusion with various astronomical data,

and with facts derived from the study of past forms of life upon the globe, the evolutionist attempts to penetrate through the long vista of bygone ages till he may rest his speculative gaze upon a vast rotating nebular mass of gaseous matter from which he supposes our universe to have been slowly evolved ; assuming that our planet had a past history of this kind, he must also assume that it rapidly changed from a gaseous to a fluid state before beginning to solidify by the formation of a superficial crust, which gradually thickened as the fervent heat of it radiated into space. Until this stage of the earth's history had been far advanced no living thing could have existed upon its surface. Living things must, however, have appeared upon its surface at some very remote epoch, since their remains are to be found far down in the rocks which at present constitute its crust. How, therefore, it may be asked, is the first appearance of life on this earth to be accounted for?

We should not invoke an unknown act of creative power unless more ordinary natural causes fail, and it really be found necessary to invent some such a hypothesis. Now, the thorough-going evolutionist repudiates the notion of creation in its ordinary sense. He believes that the operation of natural causes working in their accustomed manner were quite adequate to bring into existence a kind of matter presenting a new order of complexity and displaying the phenomena we call life. Living matter is thus supposed to have come into being by the further operations under new conditions of the same agencies as had previously led to the various inorganic constituents of the earth's crust—such mineral and saline substances as we see around us at the present day, so that in accordance with this view we have no more reason to postulate a miraculous interference or exercise of creative power to account for the evolution of living matter in any suitable portion of the universe, whether on this earth or elsewhere, than to explain the appearance of any other kind of matter. The question might be asked whether life still continues to come into existence from inert or lifeless matter? Herbert Spencer, the great apostle of evolution, sees no reason why it may not do so. Professor Bastian, and a good many others, maintain that it really does so, as proven by a series of experiments extending over a lengthened period. He contends that all the conditions of matter necessary to the beginnings of life still exist, and that

new life is continually being evolved. Professor Huxley is quite in agreement with Spencer and Bastian as to the beginning of life, but appears to think that existing conditions of matter on the earth's surface are not favorable to new beginnings of life. Dr. A. Wilson sums up the question in the following words: "Although research has not as yet finally placed the puzzle of life and its solution at our feet, our inquiries have at least served to indicate the direction towards which modern scientific faith is slowly but surely tending. The search after a material cause for phenomena formerly regarded as thoroughly occult or supernatural in origin, is not a feature limited to life science alone. Such a characteristic of modern research indicates with sufficient clearness the fact that, as biology and physics become more intimately connected, the explanations of the phenomena of life will rest more and more upon a purely physical and appreciable basis. That life had a distinct beginning upon the earth's surface is proved by astronomical and geological deductions. That life appeared on this world's surface, not in its present fulness, but in an order leading from simple forms to those of an ever increasing complexity, is an inference which geology proves, and which the study of animal and plant development fully supports.

That the first traces of life existed in the form of protoplasmic germs, represented to-day by the lowest of animal and plant forms, or rather by those organisms occupying the debatable territory between the animal and plant worlds, is well nigh as warrantable a supposition as any of the preceding. And last of all, that these first traces of protoplasm were formed by the intercalation of new combinations of the matter and force already and previously existing in the universe is no mere unsupported speculation, but one to which chemistry and physics lend a willing countenance. Living beings depend on the inter world for the means of subsistence to-day. Is it more wonderful or less logical to conceive that at the beginning the living worlds derived their substance and energy wholly from the same source? The common origin of animal and vegetable life, and the further unity of nature involved in the idea that the living worlds are in reality the outcome of the lifeless past, constitute thoughts which leave no break in the harmony of creation."

A few words on the origin of species, as very generally accepted in the scientific world, may not be without interest. I can only give a meagre outline of the general principles :—

"A few great naturalists, previous to the time of Darwin, struck by the very slight differences between many species of animals, and the numerous links existing between the different forms, and also observing that a great many species do vary considerably in their form, color and habits, conceived the idea that they all might be produced one from the other. The most distinguished of these writers was the great French naturalist Lamarck, who published an elaborate work, "Philosophie Zoologique," in which he endeavored to prove that all animals whatever are descended from other species of animals. He attributed the change of species chiefly to the effect of changes in the condition of life, such as climate, food, etc., and especially to the desires and efforts of the animals themselves to improve their condition, leading to a modification of form or size in certain parts, owing to the well-known physiological law that all organs are strengthened by constant use, while they are weakened or completely lost by disuse. The arguments of Lamarck did not, however, satisfy naturalists, although a few adopted the view that closely allied species had descended from each other. The general belief of the educated public was that each species was a "special creation" quite independent of all others, while the great body of naturalists equally held that the change from one species to another, by every known law or cause, was impossible, and that the "origin of species" was an unsolved and probably an insoluble problem.

The only other important work dealing with the question was the celebrated "Vestiges of Creation," written by the late R. Chambers, of the great publishing firm of W. & R. Chambers, of Edinburgh. In this work the action of general laws was traced throughout the universe as a system of growth and development, and it was argued that the various species of plants and animals had been produced in orderly succession from each other by the action of unknown laws of development aided by the action of external conditions. But no great change of opinion was effected among naturalists until after the publication of the "Origin of Species" in 1858 by Charles Darwin. There was then no question of the origin of families, orders and classes, because the

very first step of all was believed to be an insoluble problem. But this is now all changed. The whole scientific and literary world, even the whole educated public, accepts as a matter of common knowledge the origin of species from other allied species by the ordinary process of natural birth, the idea of special creation being all but extinct.

A summary of the Darwinian theory of the origin of species by Alfred Russel Wallace, is as follows :—"The theory of natural selection rests on two main classes of facts which apply to all organized beings without exception, and which thus take rank as fundamental principles or laws. The first is the power of rapid multiplication in a geometrical progression; the second, that the offspring always vary slightly from their parents, though generally very closely resembling them. From the first fact or law there follows necessarily a constant struggle for existence, because while the offspring always exceed the parents in number, generally to an enormous extent, yet the total number of living organisms in the world does not and cannot increase year by year, consequently every year, on the average, as many die as are born, plants as well as animals; and the majority die premature deaths. They kill each other in a thousand different ways; they starve each other by some consuming the food that others want; they are destroyed largely by the powers of nature—by cold, by heat, by rain and storm, by flood and fire. There is a perpetual struggle among them, which shall live and which shall die; and this struggle is tremendously severe because so few can possibly remain alive—one in five, one in ten, often only one in a hundred or even a thousand.

"Then comes the question, Why do some live rather than others? If all the individuals of each species were exactly alike in every respect, we could only say it is a matter of chance. But they are not alike. We find that they vary in many different ways. Some are stronger, some swifter, some hardier in constitution, some more cunning. An obscure color may render concealment more easy for some. Keen sight may enable others to discover prey, or escape from an enemy better than their fellows. Among plants the smallest differences may be useful or the reverse. The earliest and strongest shoots may escape the slug; their greater vigor may enable them to flower and seed in unfavorable weather; plants best armed with spines or hairs may escape being

devoured; those whose flowers are most conspicuous may be soonest fertilized by insects. We cannot doubt that, on the whole, any beneficial variation will give the possessors of it a greater probability of living through the tremendous ordeal they have to undergo. There may be something left to what may be called chance, but on the whole "*the fittest will survive.*" Then we have another important fact to consider,—the principle of heredity or transmission of variations. If we grow plants from seed or breed any kind of animals, year after year, consuming or giving away all the increase we do not wish to keep just as they come to our hand, our plants and animals will continue much the same; but if we every year carefully save the best seed to sow, and the finest or brightest colored animals to breed from, we shall soon find that an improvement will take place, and that the average quality of our stock will be raised. This is the way in which all our fine garden fruits and vegetables and flowers have been produced, as well as our splendid breeds of domestic animals; and they have thus become, in many cases, so different from the wild races from which they originally sprung as to be hardly recognizable as the same. It is, therefore, proved that if any particular kind of variation is preserved and bred from, the variation itself goes on increasing in amount to an enormous extent, and the bearing of this on the origin of species is most important; for if in each generation of a given animal or plant the fittest survive to continue the breed, then whatever may be the peculiarity that causes fitness in the particular case that peculiarity will go on increasing and strengthening so long *as it is useful to the species.* But as soon as it has reached its maximum of usefulness, and some other qualification or modification would help in the struggle, then the individuals which vary in the new direction will survive; and thus a species may be gradually modified, first in one direction and then in another, till it differs from the original parent form as much as the greyhound differs from any wild dog or the cauliflower from any wild plant. But animals or plants which thus differ in a state of nature are always classed as distinct species, and thus we see how by the continuous survival of the fittest, or the preservation of favored races in the struggle for life, new species may be originated. Past time has been to all intents and purposes infinite. Hence it is probable that the existent species of animals and plants have

been evolved through natural selection acting through long periods of time from a few primitive and simple forms of life."

It will be observed that Mr. Darwin does not attach much weight to environment as a great agent or factor in the origin or modification of species. Other naturalists of eminence differ from Mr. Darwin in this respect, and maintain that the influence of surrounding physical conditions, as held by Lamarck, is quite as potent a factor as natural selection, in bringing about the changes which are ever taking place in the structure of organic life. It has often been observed that when certain kinds of animals change their habitat, organs that cease to be useful gradually disappear, while new organs or adaptations of already existing ones to changed habitat as surely come about. In the January number of the *Popular Science Monthly* there is published an article by A. S. Packard, whom most of you have heard about, on the effect of cave life on animals, in which he shows most conclusively that gradual loss of the organs of sight occurs to animals so situated, and that modification of other organs takes place, such as the lengthening of the antennæ or feelers, etc.,—that is, the sense of touch becomes greater as the necessities of the conditions demand its use. In such cases as these Dr. Packard thinks there is little room for the operation of natural selection, and that it plays a very subordinate part in the set of causes inducing the origin of these forms. I will not attempt to state the evidences which have been advanced by scientists to prove the relationship and unity of organic life as manifested by embryology, by rudimentary organs found in many animals for which now there is apparently no use, and by the fossil remains of animals now extinct but showing close affinity to those now living, but will only say in conclusion that the longer anatomical and geological investigations continue, the more surely does it appear that all animated beings began their life course in the form of a simple cell, and that by a long process of evolution they have come to be differentiated into the numberless forms in which we now find them, all tied together by an endless chain without even one missing link.

MONDAY AFTERNOON POPULAR LECTURES.

CONCHOLOGY.

By Rev. G. W. Taylor.

(Delivered March 10th, 1890.)

After some preliminary remarks concerning the scope of the study of Conchology and the best way to make a collection of shells, the lecturer proceeded to give an outline sketch of the classification of the Mollusca. He showed that they are divided into four large divisions, in accordance with the form and position of their organs of progression. These divisions are—

I. CEPHALOPODA, as the Nautilus and Squid, which have their feet grouped around the head.

II. GASTEROPODA, or stomach-footed, as the common snail which progresses by the regular movement of the muscles of the ventral surface.

III. SCAPHOPODA, or boat-footed, a very small order containing only the *Dentalia* or Tooth Shells and their allies.

IV. PELECYPODA, or axe-footed Mollusca. This order contains all the bivalves, such as oysters, clams, mussels, etc.

Under each of the heads an account was given of the anatomy, geological age and present distribution of some of the better known species, and attention was drawn to the importance of studying the animal of the different shells.

Before closing his interesting lecture Mr. Taylor went on to speak of the way in which the study of the variations of species in the mollusca brought the conchologist face to face with the great theories of evolution and development. He said:—"A paper on evolution was read before this Club a week or two ago and in the discussion that followed, a remark fell from one of the speakers concerning the *conflict* between evolution and theology. Now, as I know, that there are many of you who would hesitate to accept evolution, if at variance with theology, while there are others, perhaps, who would eagerly throw overboard their theology, if apparently contradicted by evolution. I think that it may be useful to state the opinion on these matters of one who has

studied, and who conscientiously accepts the teachings of both theology and science.

Science, of course, should be primarily an independent study. Scientists have no time and little inclination usually to study theology, and neither have theologians, as a rule, the opportunities to become masters of science. When science has demonstrated a *fact* there can be no gainsaying it; it will over-ride any theological dogma; but a scientific *theory* does nothing of the kind. For instance science has *proved* that our world was not made in six days of 24 hours, as it used to be believed, and theologians accept the *fact* and find it in no way inconsistent with their Bible.

Science has *proved* that evolution has taken place, and is taking place, in both the animal and vegetable world, and theologians accept these facts also.

But science has *not yet proved* that evolution is the cause of *all* the various forms of life we have to-day, and it has *not yet proved*, and I am confident never can prove, that any life can originate *of itself*. Let it prove even the former of these propositions, let it trace back every animal and vegetable to one original speck of protoplasm, and even then science will not do away with the necessity of a creator."

Mr. Taylor went on to explain how Dr. Bastian's theory of abiogenesis had been completely upset by the experiments of Prof. Tyndall, and then said: You will see therefore that there is no necessary conflict between the theory of evolution and theology. Both parties (the theologians and the scientists) are often rather unreasonable. Theologians have sometimes been tempted I know to dogmatise unnecessarily, but on the other hand scientific men are constantly asking them to swallow pounds of theory with every few grains of fact. I for one am ready to accept the facts, and I believe that the principles of evolution have been conclusively proved, but I do not feel called upon to accept at present all the extravagant theories that the more extreme disciples of Darwinism have put forward.

In conclusion, my excuse for introducing this subject into an address on conchology must be the fact that from this science evolutionists have drawn some of their strongest arguments, while in it also they have met with some of their greatest difficulties.

BOOK NOTICES.

Several pamphlets have been sent to the editor, which will be noticed as space and occasion permit. The following will be of interest to fruit-growers :—

"The composition of Apple-tree Leaves" by F. T. Shutt, M.A., F.I.C., F.C.S., Chemist to the Dominion Experimental Farms. The above is the title of a useful paper, the separates of which have just been distributed, that was read by Mr. Shutt before the convention of fruit-growers of the Dominion, held at Ottawa in February last. The work was undertaken with the object of suggesting a rational method for the application of fertilizers to apple orchards. Analyses are given of the leaves of five of the best known varieties, at two different stages of growth—on 25th May when the leaves were just unfolded and on 20th September when they had fully matured. The results are given in tabular form, arranaged under the following heads :—i. Composition of Leaf, showing the percentages of moisture, organic matter and ash. ii. Percentage composition of important constituents in Ash, giving the amount of phosphoric acid, potash, lime, magnesia, oxide of iron and silica. iii. Nitrogen in Organic matter. iv. Weight of Fertilizing Constituents in 1,000 lbs. of Leaves, namely, Nitrogen, Phosphoric Acid and Potash.

From the data in the above table we ascertain the extent to which the soil is exhausted by the apple-tree as regards its leaves. This is valuable knowledge. We are told that Mr. Shutt intends to make a complete series of analyses of the apple tree in which the old and young wood as well as the fruit will be included. We shall then have definite knowledge by which the fruit grower will be able to obtain the best results, and will be able to carry on his operations with precision and without doubt as to the results. Below are Mr. Shutt's conclusions, founded upon his scientific investigation, and it will be seen that they coincide exactly with the results which have been arrived at by practical orchardists after many years of experience and trial, with the important difference that the scientific man knows that his results must be accurate, while the man who has only his practical experience to back him only thinks he is right without knowing the reason why :—

"Phosphoric acid, potash and nitrogen are the three constituents which above all others must be put back into the soil if we are to preserve its fertility. Plants of certain orders require more of one or other of these than plants of other orders. Some soils are specially rich or poor in one or more of the materials, and consequently in the rational mode of application of fertilizers much intelligence and patience must be exercised.

That the leaves of the apple trees draw a large amount of food from the soil annually, has been shown. This must be replaced in excess for the vigourous growth of the tree. The leaves of the tree play no unimportant part—respiration and digestion are their two chief functions—which, if they do not perform well, the tree cannot live and bring to perfection its fruit. Therefore, when we feed the leaves we are indirectly feeding the fruit.

The results of this work seem to point in the direction of mineral fertilizers, and specially of potash, as being more particularly required for the growth of the leaves, and, therefore, for the vigorous development of the tree, including an abundant crop of fruit.

A heavy dressing of wood ashes (which may be procured in many parts of Canada at a very low price) or of kainit or other form of potash is, therefore, to be recommended for orchards.

The value of the leaves composted—a process to be advised as more economical than burning—is also well established by the data afforded by this work."

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LIBRARIAN'S REPORT 1889-90.

To the Council of the Ottawa Field Naturalists' Club :—

GENTLEMEN,—I have the honour to report that, as soon as possible after taking office as your librarian, I collected the books and periodicals forming the library of the Club, as well as the back numbers of the Club publications, from those of my predecessors who still had them in their keeping. Through the kindness of the Custodian of the Ottawa Literary and Scientific Society, I have been able to find storage room for these in the lecture room of the society. This has enabled me, to a certain extent, to classify and arrange them, and to prepare in

rough form a catalogue, which I regret exceedingly lack of time has compelled me to leave in that form, but which, with the permission of my successor, I shall revise and copy before handing it over to him. In making the catalogue I found that almost all the sets of back numbers of exchanges were incomplete, but on receiving authority for that purpose from the Council, I exchanged missing back numbers with such of our exchanges as were willing to do so, and they were nearly all so willing. The result is that, at a slight extra expenditure for postage, the sets are now in most cases complete, as far as the missing numbers can be had in print. Four exchanges have been added to our list during the year, viz.:—*The Royal Swedish Academy of Science*, Stockholm; *The American Geologist*, Minneapolis, Minn.; *The Wisconsin Academy of Science*, Madison, Wis., and *The Nautilus*, Philadelphia, Pa. It is a matter for congratulation that we have been able to appropriate the sum of $8.40 for binding. With this I have have had bound twelve volumes of convenient size, containing in all eighteen volumes of periodicals, as follows:—*The Auk*, 6 Vols.; *Bulletin of the Torrey Botanical Club*, 8 Vols., bound in 3; *Proceedings of the Boston Society of Natural History*, 1 Vol.; *Transactions of the O. F. N. C.*, 1 Vol.; *The Ottawa Naturalist*, 2 Vols. bound in 1. The fact that several of these have already been borrowed by members, indicates the desirability of pushing on the work of binding as fast as our resources will from time to time permit. It is also desirable that when we move to other quarters, as I believe we soon must, larger and more suitable accommodation should be provided for our books, many of which are extremely valuable. A list of the publications received as donations and exchanges during the year appears in the number of the NATURALIST issued to day.

Respectfully submitted,

WM. A. D. LEES, Librarian.

Ottawa, March 14th, 1890.

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WINTER SOIREES.

The Soiree Committee requests such members of the Club as are willing to read papers during the coming winter to send in to the Secretary, as soon as possible, the titles, and at the same time to indicate approximately the date when they prefer to present them.

SUMMARY

—OF—

Canadian Mining Regulations.

NOTICE.

THE following is a summary of the Regulations with respect to the manner of recording claims for *Mineral Lands*, other than Coal Lands, and the conditions governing the purchase of the same.

Any person may explore vacant Dominion Lands not appropriated or reserved by Government for other purposes, and may search therein, either by surface or subterranean prospecting, for mineral deposits, with a view to obtaining a mining location for the same, but no mining location shall be granted until actual discovery has been made of the vein, lode or deposit of mineral or metal within the limits of the location of claim.

A location for mining, except for *Iron* or *Petroleum*, shall not be more than 1500 feet in length, nor more than 600 feet in breadth. A location for mining *Iron* or *Petroleum* shall not exceed 160 acres in area.

On discovering a mineral deposit any person may obtain a mining location, upon marking out his location on the ground, in accordance with the regulations in that behalf, and filing with the Agent of Dominion Lands for the district, within sixty days from discovery, an affidavit in form prescribed by Mining Regulations, and paying at the same time an office fee of five dollars, which will entitle the person so recording his claim to enter into possession of the location applied for.

At any time before the expiration of five years from the date of recording his claim, the claimant may, upon filing proof with the Local Agent that he has expended $500.00 in actual mining operations on the claim, by paying to the Local Agent therefor $5 per acre cash and a further sum of $50 to cover the cost of survey, obtain a patent for said claim as provided in the said Mining Regulations.

Copies of the Regulations may be obtained upon application to the Department of the Interior.

A. M. BURGESS,
Deputy of the Minister of the Interior.

DEPARTMENT OF THE INTERIOR,
Ottawa, Canada, December 19th, 1887.