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THE OTTAWA NATURALIST

VOL. XXIX.

MAY, 1915.

No. 2.

SUGGESTIONS FOR ORNITHOLOGICAL WORK IN CANADA.

BY P. A. TAVERNER,
Geological Survey, Ottawa.

(Continued from page 18).

The local worker, then, should collect industriously and determine his specimens with accuracy, getting expert opinion whenever necessary. The fact that no one can be equally familiar with all the recognizable forms of every species should be recognized and no hesitation shown in referring to those having greater experience in special directions. It should be the endeavour to study the bird life of the chosen locality thoroughly and no means should be neglected to extend an understanding of conditions in past times as well as present. For this purpose old literature pertaining to the locality should be searched and the accounts verified as far as possible. In fact the compiling of a bibliography of local application is an important line of research. The aim should be to tie up every record, when possible, with an extant and fully confirmed specimen, if not one in the observer's collection, its whereabouts should be noted so that it may be available for future examination and reconsideration. Examination of old collections of stuffed birds in out of the way places and old houses is a fruitful source of information, but the greatest care should be exercised in substantiating the data in connection with them. When there is any doubt whatever on this point the fact should be noted. In fact, to a local faunal list it is better to add a hypothetical list for all species whose occurrence cannot be substantiated by specimens or on equally unimpeachable evidence. A long hypothetical list is often an indication of careful work rather than the contrary.

In collecting, the local student should attempt to gather representative series of all the birds of his area, showing every possible plumage in which they occur in the locality. This means

more than single individuals or even pairs, nor is one only of each stage sufficient. Any single individual may be and usually is abnormal in some particular. It is only by a series of several that the average can be established. Freaks, albinos, melanos and other abnormal occurrences are of little general scientific interest, the normal is a much more desirable subject of study.

In gathering up information of specific occurrences the local taxidermist is a man to cultivate, not only to secure specimens but to learn and see what passes through his hands. It is well also to keep in touch with the shooting and sporting fraternity, for they often obtain material of great interest.

The desirable form in which to keep such collections is undoubtedly as dry skins and not stuffed and mounted specimens. The taste for the latter is waning for one thing, and they are otherwise too bulky to house and keep in any number. As the object is the indefinite preservation, the skin is much to be preferred, for the action of dust and light, to say nothing of insect ravages upon mounted specimens, is highly destructive and their life is limited. Besides this, a mounted specimen is not available for the handling necessary for close examination. One hesitates to maltreat a nicely mounted bird to get at hidden characters, that are easily seen in properly made skins.

A word here may be included as to the much vexed question of subspecies and how far it is desirable to recognize and study them. Originally, when the conception ruled that living forms were the result of special creation, a species was considered a fixed quantity, whose limits could be definitely placed. The acceptance of the evolutionary theory of the growth of species from others pre-existing necessitated a rearrangement of our ideas and it was found that what were regarded as permanent types were more or less unstable and that geographic variations occurred, extremes of which when compared without considering intermediate stages, exhibited differences of almost specific value. As all stages of differentiation between these extremes were to be found, it became evident that they must be regarded as evolutionary departures from the specific type and be, in fact, "species in the making," before the connecting sequence between them and the parent stock has been disrupted or broken down to form isolated species.

Our modern system of nomenclature gives each species a binomial name, one term representing the genus to which it belongs and the other the species. As it seemed desirable to apply definite cognomens to geographical variants from the typical form in order to facilitate referring to them, "give them a handle," as it were, a third name was added, making our system

a trinomial one and thus carrying out Linneaus' great invention in the spirit in which it was conceived. The result is logical and necessary, but it should be remembered that such geographical races, varieties, subspecies or whatever the student cares to call them are mere divisions of the species and the specific binomial is to be regarded as a collective name, including all the trinomial variants within its meaning. Thus a "Western Robin" is as much an "American Robin" as the "Eastern one" and the name *Planesticus migratorius* is equally applicable to any of the forms into which the "American Robin" divides. It is in fact only necessary to name subspecies either vernacularly or scientifically where special exactness is required by context or scope of consideration. In any event, it is wiser to ignore it altogether unless there is definite and accurate knowledge for justification. Subspecific designation should only be based upon examinations and authoritative determination of specimens, and not upon probabilities or assumptions.

In every subspecifically divided form there is one race that is called the "type form," loosely called the "species;" this is scientifically named by repeating the specific name in the trinomial; as, the Eastern Robin, *Planesticus migratorius migratorius*. Theoretically this should represent the original stock from which the variants departed but as these are often impossible to determine and scientific nomenclature must be exact, it means in practice that this form is the one that was first discovered or described and to which, by the canons of nomenclature, the name must permanently adhere. The type race then, is really of no more scientific importance than its co-races.

The realization of the proper relative importance between type and subspecific forms and the applications of sane principles in practice will go far towards rectifying the abuses from which a valuable system has suffered.

Some subspecies are marked and conspicuous in character; but as there must be species in all stages of making, some exhibit but minute differences only evident from the examination of series of comparable material by trained perception and judgment.

Theoretically, the numbers of subspecies of a widely varying race must be innumerable, but the most of them are too fine for human recognition. The question is, of course, where to draw the line. Subspecies are actual facts and do exist. Whether it is serving the best interests of science to deferentiate and name the finer variations that only an expert, especially trained, can recognize is a subject, that is still being argued. However, whether we hold with the "Splitters" or the "Lumpers" it

seems best for the majority of us to follow the lead, perhaps under protest, of the consensus of representative opinion as evidenced by our American Ornithological Union Check List, though we can reserve to ourselves the liberty of departing from their findings in cases where mature judgment or data justifies it. However, for the sake of uniformity it is better to err on the conventional rather than the radical side and to keep as largely as possible in harmony with accepted contemporary authorities.

Others, to the contrary, notwithstanding no enduring faunal work, can be accomplished without the collection of specimens. The field-glass and camera are most valuable auxiliaries, but cannot altogether take the place of a bird in the hand. Due regard must, however, be given to the principles of humanity. Collecting is a necessary evil to scientific study and is amply justified by it, but the responsibility of the collector is great and his influence should be always thrown against the useless killing of anything. The collector kills for a good and sufficient reason and should never do it, without that justification. Man, who has been given or has assumed the rights of the earth, should recognize his responsibilities and bear the relation of a guardian to harmless lower life. Our laws recognize this and it is necessary for a collector to get a permit from the game warden of his province. This, however, is issued to duly qualified students who should be careful that the privilege is not abused. Nothing should be killed without a good and sufficient reason and when so killed particular care should be exercised that the best use possible is made of it and that it is preserved for all times.

The privilege to collect specimens, the legal property of the people, is granted by the representatives of the people for the benefit and increase of knowledge of the people. Hence such specimens are in a manner public trusts and when once taken should be preserved as such and not for individual gain or hoarding. They should be kept as safely from damage by time, dust, light, insects or accident as circumstances permit and, as the owner has morally but a life interest in them, arrangements should be perfected, so they may be for the present available for study by other workers and finally deposited in some known repository where they will be available to coming generations of investigators.

The fear that the legitimate collector will deplete our bird life is groundless. Even were the number of our collectors increased many times and stimulated to greatly increased energy they would have a negligible effect. Large collections are sometimes pointed to as causes of a supposed reduction in bird life but all the collections in North America, the results of fifty years

industrious work, would not nearly equal the destruction caused in one year by millinery plumage hunters. When we consider the constant, widespread persecution and the number of widely distributed sportsmen it has taken to reduce our game birds, it is obvious that a few scattered collectors can have little, if any, influence upon the bird population. The ideal conditions suggested before, call for a collector in every county. If we had but one dozen sportsmen shooters in every county would game be scarce to-day?

There is also a sentiment against the scientist collecting "rare birds" on the supposition that if these were allowed to breed they would become common. There are practically no birds, but game, raptorial and plumage forms, that suffer systematic persecution. The number of small or rare birds that are killed by human agencies, except for profit or food, is on the average negligible. Are there a dozen people in Canada, seeking or hunting for Cory's Least Bittern? How many would know one if they saw it? The species has had hundreds of generations in which to become common, if they are rare now it is due to the action of still operating natural causes. The rarity of a creature not especially or generally hunted for profit is an indication that it is not adapted to conditions and is nearing extinction through natural causes. Rarity obviously just precedes extinction.

Of course with species that are much hunted, or that are rare, owing to the geographical limitations of the habitable or breeding ranges, the question is different. Scientific collectors have occasionally gone into small, isolated colonies and practically wiped out a species that, but for them, might have survived for a while longer. But even in these cases the fact of such limited range itself indicates that the species is declining and its end has been only hastened. A dominant, virile race will tend continually to spread; that it has not done so, it is an indication of inherent weakness in the species.

The Passenger Pigeon is often pointed out as an example of man's ruthlessness, and a great deal of sentimentality has been exercised over it. In the first place, great flocks of birds of this species would to-day be incompatible with agricultural pursuits. If man destroyed the Passenger Pigeon it was by extensive netting operations against them and not by the desultory shooting of scattered farmers and sportsmen. Yet the last year of netting at the Petosky rookeries left countless pigeons alive. The fact that few of these returned the next spring was no fault of the trappers. For years thereafter occasional flocks and bunches of Passenger Pigeons were seen;

enough to have stocked the continent, at any rate to the limit of economic safety, had they been adapted to present conditions. The Bluebird population was almost entirely wiped out one winter. Fewer were left of them than of pigeons just after the Petosky rookery was deserted; yet in five years the Bluebird regained its old numbers. But the Bluebird is a strong, virile race, suitably adapted to the conditions of a cultivated country. The pigeon was not; hence it passed away while its close relative, the Morning Dove, still thrives and increases.

It must be borne in mind that our bird population is limited by natural conditions. In most cases this limit was reached long ago, and no more birds can inhabit North America than can find support during the season of least food supply. In a normal or stationary population, the death rate must equal the birth rate or else the population ceases to be stationary. The breeding season increases the population enormously and one way or another this increase must be, and is, reduced to the smaller supporting power of the land through winter.

It is evident that this allows of a considerable margin of reduction and shows that even quite considerable numbers can be destroyed without interfering with the ultimate numbers of the population and that the comparatively few individuals taken by collectors cannot have an appreciable effect upon their number.

The professional collector has come in for popular abuse, far beyond his deserts. In the first place, the professional collector is almost an unknown quantity. He is too scarce in fact to find when wanted. In the next place, there is little or no market for his wares. Few scientists are wealthy or able to pay prices that allow the professional a livelihood. The trade in big game heads and trophies with wealthy sportsmen is considerable and the plumage business for millinery purposes has wrought devastation amongst certain species but the opportunities for professional scientific collectors are small indeed. This is to be regretted as, allowing that the study of birds is justifiable, it follows, as a matter of course, that the man who supplies the material is justified also and is engaged in commendable work. No one person can personally gather material from everywhere, yet extra-limital material is just what the serious investigator requires in his work. Without a system whereby the earnest student can, at least partially, pay the expenses of his explorations, modern science would still be in the dark condition of middle ages. The epoch making field works of Bates or Wallace would have been impossible if they had not found a market for their wares.

To hope that each of our counties will have facilities for the proper and safe storage for such valuable objects is perhaps to wish for the millennium. However, many of the provinces are establishing museums, that should develop into just such repositories for provincial data and we hope the time is not distant when this use of them will be more highly and scientifically developed. In the meantime we have a Dominion Museum, that is prepared not only to store but to scientifically use such material and is slowly building up a national collection for future Canadian students in proportion with the growing dignity of the country it represents. It is to be hoped that the time will come when it will take equal rank with other national museums of the world, the British Museum, the Smithsonian Institute and others of like repute. To do so, however, requires the co-operation and sympathy of the Canadian people as a whole. No public institution can do all the necessary work itself but must rely largely in the building up of its collections and prestige upon the interest and aid of the people it represents. Thus grew the great British Museum through the practical help of its private friends into an institution that is an imperial pride. On this side of the water the scientific and enthusiastic generosity of such men as Roosevelt, Abbot and others who donate large collections resulting from their sporting expeditions at home and in various parts of the world to the public good, as represented by their national institutions, has gone far to place the Smithsonian Institution well into the forefront of scientific progress. Our people should be no less interested in the advancement of our institutions than those abroad are to theirs. The government alone can never raise its museums to a commanding position in the world; the people in their private character as individuals only can bring about that consummation and with them the future of zoological science rests in Canada, as well as elsewhere.

On the economic side of ornithology much work remains to be done. So far we have been content to draw from the results of the United States Biological Survey and other workers across the international boundary. In so far as they treat of our species, their problems are our problems and it is questionable whether we want to duplicate their work. They have already developed an elaborate technical staff of specialists and special facilities besides gathering an immense amount of material and data. We could not compete with their efficiency for many years. It seems, except in the case of special problems of peculiar Canadian interest, we can do better by leaving the bulk of such investigation to them, co-operating when possible

and helping when we can, secure in the knowledge that any results arrived at in Washington are applicable here and available for our use. In the meantime we will have our hands and time free for other original work and avoid unnecessary and wasteful duplication.

Systematic zoology is pre-eminently the work of the closet naturalist and though to the laity it is the proverbial dry-as-dust work of the naturalist of carature it ultimately underlies our whole modern conception of life. The tracing out of the relationships of species is our means of retracing the chain of life back through the ages to its beginnings. The conditions under which development arises gives us clues by which we are beginning to understand the fundamental principles of living creation. It is work, however, for the specially trained and can only be successfully engaged in after considerable experiences and preparatory study. In the ornithological field, so far, Canada has been too busy with practical development to give much attention to this field of endeavour. For the present, therefore, we cannot hope to seriously compete with older countries who have already trained their staffs and where collections represent material in series such as ours do not as yet contain.

However, we can all do our mite towards preparing the country for future work and future needs, gather data and specimens and gradually train a scientific body competent to attack the "riddles of existence" from the ornithological side as well as from other directions. We are all searching for the truth, the biologist, the geologist, the physicist, the chemist and the astronomer. Far apart as we seem to be in our work, we are all attacking the one great question from different directions. The answer to an astronomical detail is often found by the geologist or the chemist and the geologist receives illumination from the physicist and the biologist.

It is not an overstatement to say that zoology has had more to do with the development of modern thought in its various branches than any other science. The enunciation of the evolutionary theory had a more fundamental effect upon current thought and conception of life than anything that ever went before it. Ornithology is a branch of biology and has done its honorable share in making the intellectual world what it is to-day. If we, as ornithologists labor and do our work conscientiously, with due appreciation of our responsibilities both to science and to mankind, we can shed the light of our individual tapers in some of the dark places and add our quota to the general enlightenment. In the foregoing I have attempted to outline or indicate a course for such work.

MEETINGS OF THE BOTANICAL BRANCH.

February 20th, 1915, at the residence of Mr. R. B. Whyte. Mr. J. R. Dickson, of the Forestry Branch, spoke on the subject "Forestry in Canada." Mr. Tulley, of the same Branch, also gave a synopsis of the administrative data relating to the Forestry Branch and showed a series of very interesting lantern slides, illustrating forestry problems.

Mr. Dickson aptly emphasized the inconceivable quantities of timber used each year in Canada by pointing out that the railway companies used one hundred and fifty millions of ties each year, that the 1911 cut was five billion feet board measure, and other facts involving stupendous figures. In a condensed yet clear and forceful way, he touched on most of the great subjects comprehended in the term "forestry," forestry, as he described it, being "The Parent of Industries."

He stated that information available shows that on 60% of the croppable land, timber can be more profitably grown than farm crops. The science of forest management seeks first to ensure the permanence of the lumbering industry, and, secondly, to gain the many other auxiliary benefits, which nourish the life of a nation. The fundamental importance of wood in nearly all phases of industrial life was emphasized. At present, there is a very small stand of merchantable timber in the so-called "Great Northern Spruce Forest," the mature timber having been nearly all swept away by repeated fires during the past century. An analogous condition exists in our southern hardwood belt—but due to cutting rather than fire. Last year some 60% of the hardwood used in Canadian woodworking industries was imported.

It was pointed out that the main elements of a forest policy for Canada must be:

(1) Education of public opinion in order to provide the authority, the money, the driving power.

(2) Classification, according to its producing capacity, of all publicly owned land, to provide for permanence of use.

(3) A plan of cordial and mutually profitable co-operation on an equitable basis of duties and rewards.

(4) Organization on a strictly non-partisan basis, of a trained and efficient forest service personnel.

(5) Provision and equipment for investigation and research work relating to forest problems.

(6) Whatever legislation may be required to place trained men in charge of our forest lands, and insure uniform requirements from every forest user.

Reference was also made to the relation of the forest to stream flow as affecting domestic supply, irrigation and water-power, municipal and city forestry, and the immense wealth of fish and game in Canadian forests.

Mr. Tully, in dealing with the administrative side of the work, stated that there were thirty-one organized Forest Reserves, under the control of the Branch, each in direct charge of a trained forester. The area covered by these reserves was 43,800 square miles. In addition to these reserves, there were Fire-ranging Districts and two Forestry Stations, from which young forest trees, etc., were distributed to settlers in the Prairie Provinces. One of these stations was at Indian Head and the other at Sutherland. From the former over three million young trees were distributed in 1914. The Branch also had research laboratories at McGill University, where problems relating to the products from forest timber of all sorts were dealt with by trained investigators. Those present were:—

Messrs. Attwood, Buck, Campbell, Clark, Dickson, Eddy, Fryer, Honeyman, Lelacheur, Newman, Tulley and Whyte.

F. E. B.

March 13th, at the residence of Mr. Geo. H. Clark. Dr. J. S. Bates, Superintendent of the Forestry Products Laboratory for Canada, at McGill University, Montreal, dealt with the subject "Wood Fibre, Its uses in Pulp and Paper Making." The subject was handled in a very able and thorough manner and was made still more educative by a series of well prepared lantern slides illustrating the fibres of various woods and the pulp making process in the mills.

Mr. Clark, the host, in introducing the speaker, assured him that the members appreciated his coming from Montreal for the purpose of addressing the Club and to Mr. D. A. Campbell also thanks were due for arranging Dr. Bates' trip for this purpose.

After referring to the botanical classification of the principal and minor trees and many varied plants, which were used, or could be used, in the manufacture of paper, and the history of the various processes of making forest timber into paper, Dr. Bates stated that at the present time it cost about two cents per pound to manufacture paper from the forest timber, or stated in another way, forest timber suitable for paper making realized, when sold as paper, the equivalent that it would if sold as lumber at \$40.00 per 1,000 feet board measure. There were about 70 factories in Canada manufacturing pulp and paper. About 50 per cent of the lumber cut for this purpose was shipped out of the country as pulp wood, and of the 50 per cent made into

pulp, one-third of that was also shipped as pulp, the remaining two-thirds being manufactured into paper in Canada.

There were four main processes of manufacture, and some minor processes, which were not commercially profitable. The beginning of the manufacture of paper, from wood, dated from about 1863, and the new extensive sulphite process from about 1883. The reason why forest timber could be used to such advantage in paper making was due to the fact of the relative shortness of its fibre. The length of fibre in the Black and Balsam Spruce was better for the manufacture of news print paper than it was in the other woods of the forest. Black Spruce contributed 70 per cent of the pulp used for this purpose and Balsam Spruce about 25 per cent. In addition other conifers such as the Jack Pine and Hemlock Spruce were also used in limited quantities, as also were Poplars and Basswood among deciduous trees. The conifers were easily amenable to the chemical treatment necessary in paper making, while the Black Spruce and Balsam were the two which were also very easily bleached. The lignin, which is in larger proportion in some woods than in others, is the cause of discoloration. The chemical process, used to reduce spruce wood, dissolves out most of the lignin, leaving the 65 per cent of cellulose, which spruce contains, available for paper. In one process an alkaline solution is used by which the gums, resins, etc., of the woods are dissolved out.

By means of the several chemical processes now used the best quality of paper is made. The large proportion of 54 per cent of the total, however, is made from mechanically ground pulp in which the lignin, etc., still remains. In many cases this mechanically made pulp is mixed with a smaller percentage of chemically treated pulp, which then gives a paper of better color and quality.

The sulphite is the most important of the chemical processes. This process is one which uses a liquor, made by burning sulphur etc., in which the pulp wood is cooked. The chemical reactions which result, involves the ketone compounds, which unite with the sulphur and separate from the cellulose. The wood previous to the ten hour's cooking is barked and chopped into small blocks. In addition to the sulphite process the sulphate and the soda processes are also used in the manufacture of pulp-wood into paper. Craft or brown and all unbleached papers are made by a soda and sulphide process.

Those present were:—Messrs. Bartlett, Buck, Blackader, D. A. Campbell, R. H. Campbell, Dexter, Dickson, Eddy, Grindley, Low, Lawler, Masters, Rice, Robertson, Tulley, and the host, Mr. Geo. H. Clark.

F. E. B.

NOTE ON A WOUNDED DEER.

On December 1st, 1914, the writer shot a male deer, the condition of which, owing to strange circumstances, seems worthy of record.

The animal, a Mule deer (*Odocoileus hemionus*) had been wounded, the wound being inflicted almost surely the previous year. The bullet had entered from the right side and penetrated the flesh of both hind legs, just missing the bones, and in passing through had destroyed the genital glands. Owing to the injury to the muscles both legs were slightly drawn up behind and appeared somewhat stiff, otherwise the deer was as active and healthy as any other.

While this animal had in every respect, but one, made a perfect recovery, it presented, nevertheless, several abnormal conditions. For instance, the deer was unusually large, weighing when "dressed" 184 pounds; it also appeared far more like a doe than a buck. This was particularly noticeable in the neck which had lost all that strong muscular appearance, so characteristic of a stag, the neck, instead, being slender and doe-like. Lastly, the horns are much aborted. Close to the head is a club-like excrescence from which several points protrude. The main points, one on each side, are about ten inches long without branches, the remaining ones, consisting of two on one side of the head and five on the other, vary from mere knobs to points of five inches in length. One of the most interesting features connected with these horns is their immature condition, for while it was December, when all normal horns had long since become hard, these were still soft and in the "velvet," that is to say, still covered with short, more or less wiry, gray hairs. The horns appeared, also, to be still growing, this being evident from the fact that in falling the animal had broken one of the points, from which blood trickled.

From the general appearance of the deer, taking into consideration its size and the condition of its teeth, I am convinced that it was at least five years old, probably older. The immature conditions of the horns were doubtless due, in part, to the wounds having taken many weeks to heal; while their crumpled abnormal shape and the unusual condition of the animal generally would be directly due to the nature of the wound.

This deer was extremely fat and the venison unusually sweet and juicy.

STUART CRIDDLE, TREESBANK, MAN.

A CHEAP CASE FOR SMALL MUSEUMS.

BY HARLAN I. SMITH.

Geological Survey, Ottawa.

For many years we have heard complaints from museum curators and others interested in museums, that there was not sufficient money available for the purchase of specimens, the erection of a desired building, and the making of cases. It is true this complaint was not always, though often, made as a sort of apology for the lack of arrangement and labelling, the presence of dirt, and the failure of the museum to be useful to the community, or even interesting to the average visitor. Some museums spend for specimens thousands of dollars annually, for many years in succession, while their exhibition halls lack sufficient labels of all kinds, and especially the general divisional labels and case labels which are among the first needed to make a museum useful to the public. It is like paying \$5.00 for a volume and not reading it when it were better to buy a five cent book to read. It is known by actual experience that a few hundred dollars invested in lumber, stain and the services of a painter, will remove this main stigma of faulty labelling from a fairly large museum. After all, a museum had better be without many specimens than to be lacking in essential labels. One specimen, such as a diamond or an elephant, may cost more than thousands of equally instructive specimens, such as a piece of coal or a kernel of corn, and will actually use up funds needed to completely label a large part of a great museum or an entire small one. Many institutions waste years in discussing what color, and weight of cardboard, or other material is to be used for labels, and many years pass before any exhibit is adequately labelled; it would be better to attach labels—either written in longhand, or by typewriter, so that the present generation may get useful service from the exhibit. Such tentative labels may be replaced whenever a better kind is decided upon.

Waiting for a fire-proof, or permanent, or larger building is certainly a waste of time. I once knew of a professor who complained that he could not teach a number of interested students because he had no class room, but I believe I can recall hearing of certain great teachers of antiquity, who taught their disciples by the road side, without either class room or place to lay their heads, and this idea also applies to museums, for after all, the whole out-of-doors is the best museum. A corner in every school-house may be a museum; a nook in every Board of Trade building may serve the same purpose; even the Sunday

School room may have its museum. A cheap inflammable building may be a more useful museum building than a fire-proof structure costing millions. In an inflammable building it would not be wise to store valuable material, but in it could be displayed labels, pictures, maps and books illustrated by such cheap and common specimens as elm leaves, squash seeds, broken pebbles, English sparrows, mice, or the skull of a dog. A museum of such specimens, accompanied by appropriate labels, books, maps, pictures and models, might easily be of more service to a community than some existing museums costing say ten times as much.

Case problems may delay curators not months but years. First there is the discussion as to what kind of a case and how to make it dust proof; what it should be made of, the color the back-ground is to be painted, or whether burlap will be used instead of paint. In this way, while waiting for cases, years go by. People who would use the museum grow old and die. Children who have time in their receptive condition of mind to profit most in the museum grow up and have their time occupied by necessary labor. Their minds become blunted to the useful impressions which they might gain in the museum, and still the museum curator has not secured the case he needs for the exhibit in time to benefit all the classes of people, from the old people to the school children. As a matter of fact, all these people could have gotten the maximum amount of benefit from the museum, had the specimens been exhibited without any case at all, on the wall, on tables, on the floor, or even out in the big out-door world, had there been sufficient and appropriate labelling. Thus the kind of material and color of case seems to have little to do with the usefulness of a museum. I have seen museums with black cases, white cases, reddish cases, yellowish cases and portions of museums with no cases at all, and every one of these had some exhibits that were superior in graphic usefulness to some class of the public than were any other exhibits known to me. No doubt the back-grounds should be carefully considered, certain colors being better than others. Perhaps the relationship of colors or general harmony and the relationship of light and a subdued quietness of color are of extreme importance, but visitors have been in a museum where the cases were entirely white, been interested and obtained useful information some little time before noticing whether the cases were white or black. While black cases may not be advisable, several of our best museums have them, and in some instances one sees the exhibit before it is realized that the case is black. No doubt either a white or a black case may

be very bad in a wrong setting, wrong relations, or if it is not harmonious, and not used wisely.

The museum of the Natural History Society of New Brunswick, located at St. John, has a comparatively small amount of money to spend each year. In this the museum is perhaps fortunate, for in so far as the curator's funds permit, some of the most up-to-date museum methods are actually being put in force. The curator has insufficient help, a comparatively poor building and miserable cases, yet he carries on field research, conducts a lecture course for adults and one for school children, so that two lectures are given each week during the school season. Large parties of young people are taken out to investigate and study in the field; some publications are issued, material collected by school children and sent to him by their teachers is identified, and the teachers of the schools are provided with nature study leaflets suggested by the object sent within twenty-four hours of its receipt. Every school child is interested in what Willie Jones of School No. 2 found yesterday.

In autumn when the Canadian Pacific Railway supplies two cars to be drawn over its lines and side tracked for a few hours, more or less, at each station where an audience may be had, and when these cars are filled with exhibits under the auspices of the Provincial Government of New Brunswick, the curator accompanies the train. One of the cars usually contains exhibits of pigs, chickens and other live stock; other exhibits relating to agriculture consist of bees, nursery trees, cream separators, or whatever the Government experts consider may uplift the agriculture of the Province. Our curator friend installs material from his museum, supplemented by specimens collected for the purpose. Specimens of birds which benefit the farmer's crops, insects which damage them, are shown, as well as drawings hastily made with cheap materials, but which may be fastened to the walls of the car or held up while lectures are delivered to the rural audiences on subjects which will make their work more successful and pleasant. But more interesting to us in the present connection is the cheapness of the cases which the curator of the above museum has had built as a beginning towards those which he intends to have throughout the museum for the housing of instructive and useful exhibits, his idea being that while these cases are not all he would like to have them, still they will serve the purpose so that the public, old and young, scientist and layman, may derive benefit from the museum until such time as he has secured funds for ideal cases, and has decided what an ideal case is and what color to paint it. But now, he has found that if the school children of to-day derive benefit

from the exhibits in these cheap cases, when they are women and men of to-morrow, his museum, though he may then be dead, will not want for ideal cases, an ideal fire-proof building, its own railroad train, or even the most valuable though perhaps not very instructive specimens.

With this inspiration, and having in the Rocky Mountains Museum a need to build at least one case as a sample and install it within three weeks, I designed a cheap case for a small museum or a museum having small funds. A contractor in Ottawa will make such a case for \$10.00 or less, casing a museum for less than one-fiftieth the cost of our finest cases. Any ordinary house carpenter can make such a case. The materials may be obtained wherever window sashes are to be had. All the woodwork may be cut to sizes at the local mill, and this is especially desirable where a large number of cases are to be made, as it will save much of the expense of the carpenter work.

The kind of wood and moulding may be varied according to what is cheapest and most easily obtainable where the cases are being made, care being taken, however, if any moulding is used, to choose that which is simple, dignified, and will not gather dust. It may be desirable to let the size of the glass panels and even of the case depend somewhat on the size of glass that can be obtained.

The advocating of a cheap case, its manufacture, installation and use, in no way militates against advocating the best and most expensive cases on the market, their manufacture, installation and use, but on the contrary paves the way for them. The museum that waits to be useful until it can have cases costing many hundreds of dollars each will probably wait a long time for financial support. The museum that teaches and otherwise becomes useful to the public with clean, neat, though cheap cases, will gain the sound financial support which it deserves, at least as soon as the children of the present generation grow to positions of authority, and then the cheap cases may be discarded, or, better still, sold or given to a branch museum or a small struggling museum, and replaced by the very best cases to be obtained on the market or to be manufactured.

(To be continued).

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