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THE OTTAWA NATURALIST.

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PETROGRAPHY OF SOME IGNEOUS ROCKS OF THE KETTLE RIVER MINING DIVISION, B.C.

L. P. SILVER, B. Sc., Petrographical Laboratory, McGill University, Montreal.

The district from which the following specimens were collected is a comparatively new mining locality, situated between lat. 49° and 50° and long. 118° and 119°.

The specimens were collected by Mr. W. F. Robertson, Provincial Mineralogist of British Columbia, and sent to Dr. Frank D. Adams, Professor of Geology at McGill University, who intended to make a microscopical examination of them. As, however, the writer was working in the Petrographical Laboratory of McGill University at the time, Dr. Adams kindly consented to hand them over to him, and the following descriptions have been written with Dr. Adams's help and under his supervision.

As no petrographical work has hitherto been done in connection with this district, the writer decided to publish his observations, hoping they may be of interest as descriptions of rocks immediately connected with ore deposits of what may prove to be an important mining region.

The sentences between inverted commas are quotations from Mr Robertson's notes on the respective occurrences. These, together with the descriptions of localities, are taken from his report on the district, which appeared in the Annual Report of the Bureau of Mines of British Columbia for the year 1901. The numbers are taken from Mr. Robertson's specimens.

Numbers 117, 120, 138, 125 were all collected from Aspen Grove.

No. 117.—Taken from Big Watchman Mine.

"....A rock which has the appearance of being a volcanic agglomerate or breccia containing considerable lime."

Hand specimen is a fine-grained greyish rock, showing a few stains of green carbonate of copper on the joint planes.

Under the microscope, the rock is seen to be composed of a fine-grained groundmass of plagioclase felspar, in which are imbedded large porphyritic crystals of felspar twinned according to Albite and Carlsbad laws, some untwinned individuals and some microperthitic intergrowths of albite and orthoclase. There are also some forms which are now entirely filled with magnetite and chlorite, but which, from the shape, once belonged to some ferro-magnesian constituent, in all probability hornblende. There are areas in the section which consist of angular and subangular fragments, giving to it a brecciated appearance and which once evidently belonged to some closely related volcanic rock caught up by this one while it was in a molten condition.

The rock is an altered andesite, which in some parts of the mass probably passes into an andesitic tuff or breccia.

No. 120.—From Big Sioux Mine, Aspen Grove.

"The country rock appears to have been of igneous origin and is somewhat similar to that of the rest of the camp; but at this point it has been considerably altered and now approaches serpentine."

The hand specimen shows a massive fine-grained greenish-coloured rock, having green carbonate of copper stains in the cracks and on the weathered surfaces.

Under the microscope, the rock is seen to be very much altered and to consist of a groundmass and phenocrysts. The former makes up a very small proportion of the rock and consists of small plagioclase crystals. The phenocrysts consist of felspar, in large laths, showing twinning according to both the Albite and Carlsbad laws, some individuals having these two combined, thus allowing of the determination of their composition by Michel Lévy's admirable method.* By this it was found such individuals

* See Becker, G. F., on the Determination of Plagioclase Felspars in Rock Sections. Amer. Jour. of Sc., May, 1898.

consisted of an oligoclase with the composition $Ab_3 An_1$. There are also aggregates of epidote and chlorite, frequently having definite outlines, which give them the appearance of being secondary after augite. Calcite is also present as a secondary mineral; and, as accessory constituents, ilmenite, leucoxene and sphene are found in considerable quantities.

On account of the very considerable quantity of augite which was present in the original rock, as well as on account of the large proportion of iron ore present, the rock possesses a distinctly basic character, and consequently is better classed as a basalt than as an augite andesite.

No. 125.—From the Medal Mineral Claim, Aspen Grove.

"It is an extension of a dyke of from 10 ft. to 12 ft. wide, of lighter colour than the general rock, inclined to be porphyritic in structure and containing much lime; there is an impregnation of copper sulphide, but not of important quantity."

The hand specimen shows fine-grained reddish-looking rock containing greenish chlorite aggregates and a little chalcopyrite.

Under the microscope, it is seen to be of volcanic origin, being composed of idiomorphic plagioclase containing zonally arranged alteration products and some individuals of pale green augite. The rock in some places shows a brecciated structure, the phenocrysts having broken outlines, while elsewhere may be seen aggregates of epidote individuals, apparently representing inclusions of some highly altered foreign rock. There are also certain forms now outlined in hydrated oxide of iron and filled with decomposition products, highly suggestive of the former presence of olivine. Biotite is noticeable, but is in nearly all cases wholly or partially altered to chlorite.

Native copper is present in the slides and, from its appearance, seems to be of secondary origin. It borders the plagioclase crystals in narrow strings and also occurs in bunches, running off in little strings which pass through the cracks. It sometimes occurs filling spaces which were once occupied by olivine.

The rock was probably a basalt.

No. 138.—From the Magpie Mineral Claim, lying to the west of the Big Sioux.

Hand specimen is a fine-grained greenish rock, impregnated with pyrite and chalcopyrite.

Under the microscope, the rock is seen to be much altered and to present a distinct porphyritic character, the phenocrysts being relatively more abundant than the groundmass, which is composed mainly of felspar laths Of the phenocrysts, the felspar is by far the most abundant, some having good idiomorphic forms, while others show broken individuals. Augite is also abundant in medium-sized grains, which, however, have undergone considerable alteration, in some places being completely changed to epidote and chlorite. Calcite is abundant as an alteration product, and magnetite as an accessory constituent.

The rock bears a distinct resemblance to No. 120, but is relatively richer in felspar and may be considered to be a highly altered basalt.

No. 13.—Fine-grained dark igneous rock, with markedly porphyritic structure. From an exposure on Nevertouch Creek, near its junction with Kettle River.

Under the microscope, the rock is seen to consist of a rather fine-grained groundmass, in which are imbedded well-defined phenocrysts, which like the groundmass consist of plagioclase and augite. Many of the smaller felspar grains are untwinned, and all have undergone considerable alteration. Augite is quite abundant in almost colourless grains, showing much alteration to chlorite. It has a maximum extinction of 39°, which, with its other characteristics, determines it to be diopside. A few crystals which, from their general appearance and high double refraction, closely resemble olivine, are also present. Some biotite occurs in the slides, but is very much altered, now consisting largely of chlorite. A small amount of epidote is present as an alteration product, and ilmenite, which occurs associated with sphene, is abundant as an accessory constituent.

The rock is an augite andesite, or possibly, as suggested by the structure, some dyke rock of similar composition.

No. 14.—From the Gorge at the mouth of Canyon Creek. where it enters Nevertouch Creek.

"The rock formation on either side of the gorge is of igneous

origin, a fine-grained dark diabasic rock, inclined in places to be porphyritic in structure."

The collection contains two specimens from this locality, representing two different varieties of the same rock, one showing a massive and porphyritic character, while the other is scoriaceous.

Under the microscope, the rock is seen to consist of a microcrystalline groundmass composed of minute laths of felspar, showing a trachytic structure and often a fluidal arrangement. In the groundmass are included well defined phenocrysts of plagioclase, augite and biotite, also a few phenocrysts composed of a microperthitic intergrowth of two felspars, one of which may be orthoclase. Some of the plagioclase individuals are twined according to both the Carlsbad and Albite laws, which when examined by Michel Lévy's method were found to have the composition $Ab_1 An_1$.

In the second section, which is a highly vesicular variety, the vesicles nearly all show a narrow border of what appear to be zeolites which are just beginning to form in the cavities. The biotite, in this section, is dark brown in colour and contains little black needles arranged in skeleton patterns, which probably consist of rutile derived from the partial decomposition of the mica. The groundmass of this section is relatively more abundant than the vesicles and it is therefore not a true pumice, though it approaches one in appearance.

The rock is very fresh; and, from a comparison with the other rocks described, it would appear that this is a comparatively recent lava flow. It has the character and mineralogical composition of an andesite.

No. 17.—"Reddish-grey rock from the north side of Slate Creek, near its mouth."

Highly decomposed basic igneous rock, having the composition of an augite andesite.

Under the microscope, the rock is seen to possess a well marked porphyritic structure. The groundmass is microcrystalline, consisting of minute laths of felspar, which often show a fluidal arrangement, and a little chlorite and oxide of iron, representing alteration products of some ferromagnesian constituent. Through this are distributed large well defined lath-

shaped crystals of plagioclase now almost entirely altered to rhombohedral carbonates; also phenocrysts of some ferro-magnesian constituent now completely altered to a mixture of rhombohedral carbonates, quartz, chlorite and oxide of iron. The rock shows a few vesicles now completely filled with decomposition products, such as chlorite and calcite. A few well defined hexagonal crystals of fresh apatite of large dimensions occur scattered through the groundmass, also a few veins of calcite.

No. 8.—Fine-grained grey rock from Brewer Creek, Upper Kettle River.

"About one mile from the mouth of Brewer Creek and in line with the foothills, there is an outcropping of the solid rock formation exposed in the banks of the creek. The formation here seems to be chiefly granite, alternating with dykes of fine-grained basic volcanic rocks, and occasionally, apparently, with still more recent and very acid dykes."

The sample in question is taken from one of the acid dykes.

The hand specimen is a dyke rock, medium fine-grained and grey in colour.

Under the microscope, the rock is seen to be much altered and to be composed almost wholly of altered felspar crystals twinned according to the Carlsbad law, on account of which, as well as from the total absence of albite twinning, they were assumed to be orthoclase. Small narrow laths of biotite are abundant, which, however, have undergone considerable alteration, in most cases being changed to chlorite. Secondary quartz, associated with calcite and apatite, is also noticeable, and, as accessory constituents, magnetite and pyrite. The groundmass, which consists of small felspar individuals, also has a small amount of quartz, possibly secondary, distributed through it. There are a few vesicular cavities filled with zeolites.

The rock corresponds in character and composition to a minette.

No. 53.—"Porphyrite from Rebecca Mine, Rock Creek, west side of Kettle River, 4 miles above Rock Creek. Elevation 4,000'."

"The chalcopyrite is carried by a quartz vein which cuts this rock. Value of mineral, $22 per ton."

The hand specimen shows a compact fine-grained pale greenish-grey rock.

Under the microscope, it is seen to be very highly altered and to consist of a trachytic groundmass of plagioclase laths interspersed with grains of epidote and chlorite, in which are imbedded larger individuals of plagioclase, and forms which have once been occupied by phenocrysts of some ferromagnesian constituent now entirely altered to chlorite, epidote, zoisite, quartz and calcite.

The rock is too much altered to enable a determination of its precise character to be made, but it is evidently some basic igneous rock allied to andesite.

No. 30.—From the country rock between West Bridge and Stuart's hotel.

Hand specimen shows fine-grained pink-coloured rock, in which may be distinguished phenocrysts of hornblende, biotite and plagioclase.

Under the microscope, the rock is seen to be composed of a microcrystalline groundmass of felspar and quartz, in which are imbedded phenocrysts of plagioclase containing inclusions of some alteration products; also biotite altered in many cases to chlorite, associated with which may often be seen sphene. There are also a few fresh-looking quartz individuals, and outlines now entirely filled with quartz, calcite, chlorite and epidote, which were once occupied by some ferromagnesian constituent, probably augite, as they often show forms indicative of that mineral. Magnetite and apatite are present as accessory constituents.

The rock is an altered andesite.

It will be seen from the foregoing descriptions that most of the rocks described are andesites or closely related rocks. No. 14 presents a striking contrast to the others in that, while they are much altered, it is fresh and has every appearance of being a comparatively recent eruptive.

The occurrence of native copper in No. 125 is interesting, and its secondary nature is very plainly shown. It has no doubt been derived from the chalcopyrite by reduction.

NOTES ON THE NESTING HABITS OF THE BROWN CREEPER AND HUDSONIAN CHICKADEE.

By L. McI. TERRILL, Montreal.

In an article on the Brown Creeper someone has observed that this bird searched for its food as if it had lost the one thing necessary to life, and ignored the onlooker completely in its endeavours to find it. Nevertheless, I had occasion, on July 14th of this year, to find a bird startled out of its monotonous occupation. Whilst walking through a piece of hardwood, interspersed with small clumps of evergreens, and bordering on a large cedar swamp, I heard a bird uttering peeps of alarm, and, on looking for the cause, saw a Brown Creeper in a very nervous state, flitting from tree to tree without thinking of its usual occupation. Thinking there was a nest, I started towards a likely-looking balsam stub, and, on striking the tree there was a great commotion at its base, whereupon several young creepers fluttered away in different directions. This was evidently their debut from the nest, and instinctively they flew to the nearest trees and ascending spirally, picking the tree at intervals with weak little pecks, commenced their tradional life search.

To return to the nest, I found that I had broken off a large piece of bark about two feet from the base of the stub, thus disclosing the nest, which was fastened to the loose bark with threads of spiders' silk. It was a very deep structure though necessarily much flattened (as the bark was only about three inches from the trunk at its widest) in the shape of an elongated one-sided wedge. It was composed of dead lichen-covered twigs of spruce, balsam and tamarac, thrown together in a very loose mass with a lining of shreds of the inner bark of balsam. Its outside depth measured eight inches, the diameter parallel with the trunk five, and the other diameter two and one-half. The bark and trunk formed the boundaries of the nest cavity, which was perfectly flat. The nest also contained one infertile egg, which was rather elongated, of a shining creamy white slightly flecked on the larger end with reddish flesh colour.

I counted six young birds which, with the infertile egg, made seven originally contained in the nest.

On July 22nd of this year, whilst tramping through a large cedar swamp, I became interested in the actions of a Hudsonian Chickadee. I watched it for some time searching for insects, when suddenly it disappeared behind a small cedar with a larva in its bill. I did not expect to find a nest, as the top of the tree was green, but, on going around on the other side, perceived a small almost circular hole with jagged edges, about twelve feet from the ground. On rapping the tree, the bird left and became very much excited, nervously flitting back and forth from the nest. Cutting away a portion of the wood, I found the nest to contain young a few days old, six of them, I think. The spot chosen for the nest site was about the best that could be found in the swamp, situated, as it was, on a small spruce knoll near by an ice cold spring which fed a small brook. The tree, as I mentioned, was still green at the top, but from the nest cavity down was decayed and hollow at the core. Returning some time after this, to give the young a chance to vacate, I found the nest to be about ten inches below the entrance hole, which was two inches in diameter. It was composed of particles of moss, lichens and strips of soft inner bark of the cedar, felted together with rabbit's and deer's hair.

MEETING OF THE BOTANICAL BRANCH.

The eighth meeting of the Botanical branch was held at the home of Dr. James Fletcher, Experimental Farm, on Thursday, May 21st. The meeting was called for seven o'clock instead of eight in order that the members might see the many interesting wild plants growing in Dr. Fletcher's garden, especially the violets, of which he has made a special study and which were then in fine condition. Among the interesting plants growing in the garden were *Erythronium grandiflorum*, var. *minor*, and *Claytonia sessilifolia* from British Columbia, which appeared to be thriving well. The variegated form of *Trillium grandiflorum*, mention of which was made in a previous number of THE NATURALIST, was also seen growing here and proved an interesting study, also *Syndesmon thalictroides*, and *Ranunculus fascicularis* from Hamilton, Ont. Most of the time was spent in studying the violets, of

which there was a fine collection. These had been grown in pots, so that each species might be kept separate, and were remarkably vigorous and full of bloom. A table was made ready in the house and twenty-nine pots were brought in from outside, where they had been plunged. A general discussion on violets and, on Dr. Greene's recent discoveries and descriptions of new species, preceded a more critical examination of the plants by Dr. Fletcher and the members present. Prof. Macoun said that it was very important in his opinion that, in describing new species, the new one should be compared with one that was better known, as a mere description was not of much assistance in determining a species.

Dr. Fletcher gave a very interesting address, and he had in the living plants such splendid object lessons that much information was obtained, which was impressed on the minds of those present. He said that, when he began collecting first at Ottawa in 1873, he was puzzled at the different forms of violet, which at that time all went under the name of *Viola cucullata*. He showed a sheet of dried specimens having four of these types which he had called at that time alpha, beta, gamma, delta, to separate them. During recent years greater attention had been given to the study of violets; new species had been made out of these forms and named. He said that, although these new species all had some distinctive characteristics, it was impossible to identify them at all times from one character. There was great variation in growth according to conditions under which the plant was growing; there was also great variation in the colour of the flowers. Violets will make fine flowering plants in one year from seed.

Some of the distinguishing characteristics of a few of the species of violets shown were recorded.

V. septentrionalis.—Flowers below the leaves, but prominently in view.

V. subviscosa.—Outline of lower petal prominently boat-shaped.

V. Fletcherii.—Flowers royal purple, very attractive. New leaves erect, acuminate, ciliate.

V. Macounii.—Flowers have a decided pinkish tinge. Petals narrow and all bearded.

V. Dicksonii.—The commonest violet. Petioles and base of petals bristly.

V. cucullata.—Easily distinguished from *Dicksonii* by its dark eye and in the spring being perfectly glabrous. Flowers always above leaves. Grows near spring water.

V. venustula.—Serration of leaf very distinct.

The following is a list of violets shown growing in flower pots, or as fresh specimens from the garden :

affinis,
do scabrous.
blanda,
cardaminefolia, (Aylmer, Que., type locality),
cognata (Manitoba),
crenulata (U.S.),
consors, (Nova Scotia),
cucullata (Ottawa),
do (New Brunswick,
do (Quebec),
do (Prince Edward Island),
Dicksonii (Ottawa),
do (Hamilton, type locality),
do var. *glabrata*,
elegantula,
Fletcherii (Ottawa, type locality),
Labradorica,
Deconteana,
leucopetala (type locality),
Macounii (Ottawa, type locality),
melissæfolia,
nesiotica,
nodosa (U.S.),
ovata,
palmata (U.S.),
papilionacea (U.S.),
prionosepala (type locality),
renifolia,
rostrata,
Selkirkii,
septentrionalis,
subvestita (type locality),
do (Nepigon),
do (New Brunswick),
subviscosa (type locality),
vagula (type locality),
venustula (type locality),

The members of the Club present at this meeting were Miss Lee, Dr. Fletcher, Mr. Campbell, Mr. Attwood, Mr. Guillet, Prof. J. Macoun, Mr. St. Jacques, Mr. W. T. Macoun.

W. T. M.

GENERAL EXCURSION TO CHELSEA.

The first general excursion of the season was held at Gilmour's Grove, Chelsea, on Saturday, the 16th of May, and proved to be one of the most successful meetings ever held under the auspices of the Club. Several hundred persons, including members of the Club and students of the Normal School, attended, and were escorted through the woods by leaders of the different branches. Great interest was manifested in the descriptions of the plants,

insects, and rocks, given as the objects were found in the open field.

In the way of botanical specimens, we have to mention a large collection of interesting violets. Along the river, the silver maple (*Acer dasycarpum*) was found growing quite abundantly among the red maples. The former was easily distinguished from the latter by its more deeply cut leaves. The green alder (*Alnus viridis*), which is not found in many places about Ottawa, was common near the river bank.

Seventeen different kinds of butterflies were collected, the rarest species of which was *Thecla niphon*, taken by Mr. Arthur Gibson and also by Mr. A. E. Richard. Other species found by Mr. Richard were *Nisoniades juvenalis*, *N. icelus*, and *Brentis bellona*. Dr. Fletcher secured a specimen of a rare longicorn beetle, *Anthrophylax attenuatus*.

Numerous Batrachians were obtained in a shaded ravine beside a spring, such as the Wood Frog (*Rana silvatica*), the American Toad (*Bufo americana*); and Miss Wilson, of the Ladies' College, at this place, discovered a specimen of Tree Frog, of the species known as *Hyla pickeringii*, which species is of a fawn colour, and singularly marked on the back with an oblique cross. All the specimens of Batrachians were small. A specimen of Grass Snake (*Liopeltis vernalis*) was also captured by a boy and held up for inspection at the time when the addresses were given at the grove.

Leaders who attended the excursion were Mr. W. T. Macoun, the President of the Club, Prof. Macoun, Dr. Fletcher, Dr. Sinclair, Mr. A. E. Attwood, Mr. Arthur Gibson, Mr. Wilson, Dr. Guillet, and Mr. Andrew Halkett. When assembled in the pine grove, before returning to the city, the President called upon Mr. Wilson, Dr. Fletcher, and Mr. Halkett to address the assemblage concerning respectively the fossils, batrachians, and plants which had been found. The excursionists then returned to Ottawa, and numbers of the members and others have since been seeking to study out in closer detail the structure of special objects. All look back to that afternoon in the shaded woods and open field as a promising incentive in connection with the future work of the Club.

A. H.

NATURE STUDY—No. IV.

BIRD STUDY.

By W. A. DENT, Whitby, Ont.

In connection with the widespread awakening of interest in Nature Study, some attention has been and is being directed to Birds and their habits. Birds are among the most conspicuous, attractive, and easily observed objects in Nature, and, when attention is once drawn to them, the student is led into other avenues of Nature Study which will be found pleasant and profitable to pursue. A fairly comprehensive and accurate knowledge of most of our common birds is more readily obtained than would at first sight appear possible, and many good books are now to be had which render identification comparatively easy. Of these Chapman's "Bird Life," with coloured plates, and Chapman's "Handbook of Birds of Eastern North America," are probably as good as any. These books are useful in identifying birds, and perhaps also as a guide to their study; but, to be of any value educationally, our further knowledge must come from a study of the living birds in their haunts and homes.

While children probably do not consciously love nature, they have a curiosity to know more of the living things they see about them, and there can be no doubt that if children were taught more of the things they wish to know and fewer dead uninteresting facts, better educational results would be secured.

A bird which is likely to be more or less familiar to children, particularly in rural schools, is the Bobolink, and a study of its life history will be found most captivating and instructive. The beauty of his plumage and the contrast with the duller dress of the female, his rollicking joyous song, his skill in concealing his nest, his extensive migrations, in the course of which he visits many countries, can be woven into many interesting lessons. The Meadow Lark is an expert decoy, and the sight of a bird endeavouring to decoy an enemy from its young never fails to arouse the most intense interest.

It is unnecessary, however, to leave bird study to those living in the country; for, in the town in which I am now writing, many

very interesting birds regularly make their homes. Omitting the commoner ones, I might mention the Great Crested Flycatcher, Least Flycatcher, Black and White Creeper, Canadian Warbler, Ruby-throat Hummingbird, Black-billed Cuckoo, Catbird, Screech Owl, Cedar Waxwing, Maryland Yellow throat. In addition to these, many marsh and shore birds, such as Grebes, Gallinules, Bitterns, Coots, Plovers, Sandpipers, and even Ducks and Loons, regularly nest and in spite of legal and illegal shooting seem to maintain their numbers fairly well. In addition to these there are, of course, many migrants, including Warblers, Thrushes, &c, which visit the shade trees and orchards during the spring and fall migrations. Indeed the number and beauty of these migrants is generally a revelation to those whose attention is directed to them for the first time. For the purpose of studying nesting and food habits, however, the ever-present English Sparrow will afford a convenient example and may be compared and contrasted with the Robin Every child knows a good deal about these birds in a more or less vague and indefinite way, and methods will readily suggest themselves to the teacher to make this vague knowledge definite and to cultivate a habit of accurate observation.

One of the important practical results which will follow the introduction of the study of birds into the schools, will be a more general recognition of their great economic value. To those who know and love birds and all nature, this is, it is true, by no means the greatest consideration; nevertheless, it is undeniably one which appeals strongly to the popular mind.

One of the first questions which an appeal for the more general protection of birds will provoke, is almost certain to be: "Well: what good are they anyway?" If we can suppress an expression of pity for the benighted condition of the questioner, we can produce an array of facts generally sufficient to convince the most sceptical, that the vast majority of birds are well deserving of our great efforts to encourage and protect them. A familiar example is the Meadow Lark. As far as known, the food of this bird consists entirely of insects, including many such as wireworms, cutworms and grasshoppers, which are distinctly injurious to growing crops.

The Meadow Lark occasionally winters in the province (though, for what reason, it is hard to imagine), and from an examination of the stomach contents of several specimens taken in the winter, it has been found that, even under stress of weather, they had not resorted to vegetable diet, but had succeeded in unearthing various grubs and beetles. The Meadow Lark is thus in everyway a decidedly beneficial bird in the agricultural districts where it makes its summer home ; yet, in spite of this and of the beauty of its plumage and of its clear ringing whistle, it not only receives no protection at the hands of the farmer whom it befriends, but, in many cases, either the birds themselves or their eggs or young are wantonly destroyed. A very slight knowledge of the habits of the birds would do a great deal towards preventing their destruction.

In connection with the recognition of the economic value of birds, a little study will do a great deal towards clearing up many false ideas concerning hawks and owls, which are usually subject to the most relentless persecution. A little study will show that while some hawks, like the Goshawk and Sharp-shinned Hawk, and some owls, like the Great Horned Owl and the Snowy Owl, are injurious ; nevertheless, the great majority of them are, not only not injurious, but even decidedly beneficial. A careful observation of the habits of the living bird by competent observers and an examination of the contents of thousands of stomachs afford the only satisfactory test of its economic value. In the case of hawks and owls, these methods have been carefully applied and go to show that most of them are of great ecomomic value.

The value of these birds lies in the destruction by them of very large numbers of mice, rats, squirrels, gophers, and other destructive vermin. A good illustration of the value of such an owl as the Long-eared Owl, is afforded by an examination of the pellets which collect beneath the roosting places. As nearly every one knows, an owl swallows its prey whole, and the indigestible portions, such as fur and bones, become matted into pellets and are disgorged through the mouth. In the case of a roost occupied by a Long-eared Owl for some weeks during November and December, 1902, about one hundred and fifty pellets were found. These pellets were about the size of a small mouse and contained on the

average about two skulls each, with other bones and fur. The number of skulls shows that during that time the owl had destroyed about three hundred mice.

It is probable that nearly all owls and hawks will take birds if they can get them ; but, that they habitually do so, is sufficiently disproved by the above mentioned methods of observation. Another good result which would follow a more general study of birds, would be a lessening of the wanton destruction of their nests and eggs. The habit of egg collecting was formerly very prevalent and is still sufficiently common to be a serious factor in the destruction of birds. It is unfortunate that many of our most valuable insectivorous and song birds are those which, from their habit of nesting near towns and in accessible places, are particularly liable to this form of persecution. The eggs of Bluebirds, Yellow Warblers, Goldfinches, Catbirds, Phœbes, Kingbirds, Woodpeckers, Swallows, and in fact of all those birds which are most valuable and worthy of protection, still find their way in large numbers to the pockets and other receptacles of the ubiquitous small boy. It should be the duty of every teacher to do what he can to prevent this. It is not sufficient alone to point out that it is against the law and punishable by fine or imprisonment, because, in order to make such a law effective, it is necessary to create a popular sentiment in its favor. Probably the most effective way to create such a sentiment is to call attention to the economic value of birds.

Aside from these very practical considerations, however, the study of birds has an educational value which is probably not exceeded by that of any other department of Nature Study. It should be borne in mind that the object of such studies is not the acquisition of technical knowledge ; but, as Dr. Fletcher has pointed out, "to train the mind" and to aid the learner to become "self-dependent." That is indeed a valuable system of education which, while accomplishing these important ends in the best possible way, also brings the student into close, even intimate, contact with his natural surroundings. If we "in the love of Nature hold communion with her visible forms," we have an unfailing source of interest and recreation which is of priceless value to those possessing it.

THE OTTAWA FIELD-NATURALISTS' CLUB, 1903-1904.

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