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CONTENTS.

	PAGE
1. Notes on some Canadian Specimens of "Lituites Undatus," by J. F. Whiteaves	117
2. A Robin Story, by Emery Perrin, Ottawa	122
3. The Entomological Society of Ontario	124
4. Sub-Excursion	127
5. Book Notice	128
6. Nature Study—No. 6	129

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THE OTTAWA NATURALIST.

VOL. XVII.

OTTAWA, OCTOBER, 1903.

No. 7.

NOTES ON SOME CANADIAN SPECIMENS OF "LITUITES UNDATUS."

J. F. WHITEAVES.

One of the rarer fossils of the Black River limestone in the Province of Quebec, is a spirally coiled cephalopodous shell that was identified with *Lituites undatus* by E. Billings many years ago, and that certainly corresponds very well with one of the specimens that Professor James Hall has figured under that name. Specimens of this fossil, collected at the Falls of the St. Charles River at Lorette, also on the Lac Ouareau River, north of Joliette, by Sir W. E. Logan in 1852, and three miles west of Napierville, south of Montreal, are still labelled with that name in the Museum of the Geological Survey. Most of these specimens are not more than two inches in their greatest diameter.

But it has long been suspected that Hall has unintentionally included more than one species under the name *Lituites undatus*, and it is obvious, from his figures, that none of these are referable to Breyn's genus *Lituites*, as now understood.

The following is a brief summary of the literature bearing on this question :—

1842. On page 394 of the "Report of the Geology of the Second District of New York", by Dr. Ebenezer Emmons, two fossils are rather roughly figured under the name *Inachus undatus*. There is no detailed description of this species, and all that is said of it is that "this remarkable fossil is found at Watertown in the black limestone. It is rare. Casts sometimes occur which are smooth."
1847. In the first volume of the Palæontology of New York, Hall described some specimens from the same locality, which he evidently believed to be conspecific with Emmons' species, under the name *Lituites undatus*, and figures four of them on Plates XIII and XIII bis. Hall,

- however, quotes *Inachus undatus* as a manuscript name of Conrad's, who was then the State Palæontologist, and states that "this fossil is known to me only as occurring at Watertown, Jefferson County, in the Black-river (or 'seven foot tier' of) limestone, being unknown in any higher position."
1857. About this date a few specimens from the Black River limestone at Lorette and other localities in the Province of Quebec, were identified with *Lituites undatus* by E. Billings. In this year Professor E. J. Chapman expressed the opinion that these and other specimens of *L. undatus* should be referred to the genus *Cryptoceras*, d'Orbigny, but it has since been shown that this name is preoccupied.
1863. In the Geology of Canada, page 156, *Lituites undatus* is recorded as occurring in the Black River limestone on the St. Charles River, at St. Ambroise, four miles north of Lorette.
1883. Professor A. Hyatt, in his "Genera of Fossil Brachiopoda" published in the twenty-second volume of Proceedings of the Boston Society of Natural History, refers all the specimens that Hall figured as *L. undatus* to Conrad's genus *Trocholites*, but has since abandoned this conclusion. The siphuncle of *Trocholites*, it may be mentioned, is either central or near the dorsum. In this paper, also, Hyatt proposes and briefly characterizes the genus *Plectoceras*.
1884. Professor Gustav Lindström, in his memoir on the Silurian Gastropoda and Pteropoda of Gotland, says that the generic name *Inachus* Hisinger (1838) cannot be used for a mollusk, as it is pre-occupied in Crustacea, and that it "consisted of three species, of which one, *I. sulcatus*, is a *Pleurotomaria*, *I. angulatus* is an *Oriostoma*, and *I. costatus* a cephalopodous shell, probably a *Trochoceras*."
1891. Dr. A. H. Foord, in the second part of his "Catalogue of the Fossil Cephalopoda in the British Museum," claims that Hall has figured more than one species under the name *Lituites undatus*, and describes one of these as *Trochoceras Halli*. The types of Dr. Foord's species are two apparently rather small specimens, that do not show the shape or position of the siphuncle, from the Black River limestone at Lorette; but these are stated to be the same as the specimen of *L. undatus* figured by Hall on Plate XIII, figs. 1 and 1a (cæt. excl.) of the first volume of the Palæontology of New York.
1894. Hyatt, in his "Phylogeny of an Acquired Characteristia," published in the thirty-second volume of the Proceedings of the American Philosophical Society, refers all the specimens that Hall figures as *Lituites undatus* to Schroeder's genus *Eurystomites*, but says that "there are several species usually placed under the name *Lituites undatus*." He makes no mention of Foord's *Trochoceras Halli* in this connection, but gives the name *Plectoceras obscurum* to a supposed new species, which he does not figure, and of which all that he says is that it "occurs in the Black River fauna in New York and is quite com-

monly mistaken for the young of *Eurystomites undatus*; but it has an open gyroceran spiral, the siphuncle is nearer the venter, and the costæ are more highly developed and more prominent, and have a distinct character from those of that species."

In 1878, Mr. T. C. Weston visited Lorette, on behalf of the Geological Survey, and succeeded in obtaining for its Museum a fine series of large and unusually well preserved specimens, that agree very well with Foord's description and figures of *Trochoceras Halli*, but that give some additional information in regard to that species. Some of these specimens, which measure a little more than three inches in their maximum diameter, are apparently adult shells, with the apertural margin well preserved. Their coiling shows only a slight and scarcely trochoceran inflection, and is almost if not quite gyroceraconic. The lip of each of the presumably full grown specimens is thin, simple, and parallel to the obliquely flexuous ribs, or narrow rib-like plications, and minute ridges, that cross the outer whorl obliquely, and is consequently curved convexly forward on each side, and both deeply and concavely backward on the venter, which is broader than the dorsum. The sutural lines are nearly straight, and the siphuncle is cylindrical, ventral and marginal.

The resemblance between these specimens from Lorette and the *Nautilus Jason* of Billings, the type of Hyatt's genus *Plectoceras*, is very striking, and the close resemblance of similar specimens from Lorette, etc., to *N. Jason*, had not escaped Mr. Billings' notice. Indeed the only practical difference between these species would seem to be that the volutions of *N. Jason* are a little more loosely coiled than those of *Trochoceras Halli*, and that the siphuncle of the former is placed at a short distance from the periphery or venter. In the present state of our knowledge of this question, the writer is inclined to think (1) that no specimens that exactly correspond with the *Inachus undatus* of Emmons have yet been found in the Province of Quebec; (2) that all the specimens from the Black River limestone of that province that have been referred to *Lituites undatus* are *Trochoceras Halli*; and (3) that the last named species is a *Plectoceras* and should therefore be called *Plectoceras Halli*.

It may, however, be stated that, in a letter dated August 4th,

1898, Professor Hyatt expressed the following opinion in regard to *Trochoceras Halli*: "Foord's species is clearly in my opinion a species of *Sphyradoceras*, in which I now include also my genera *Peismoceras* and *Systrophoceras*. This genus and *Plectoceras* are now close allies and appear together in my N.S. of the article Cephalopoda in Eastman's translation of Zittel's Text-book of Palæontology, under the family name Plectoceratidæ. What you say about the siphuncle being ventrad of center, etc., if your specimens are also heavily annulated from a comparatively early stage and trochoceran in form, or even if comparatively symmetrical, seems to me to place them better in in *Sphyradoceras*." Yet, in the printed text of that article, which embodies Hyatt's latest views on the Cephalopoda, *Plectoceras* is said to be Ordovician, Silurian and gyroceratonic, and *Sphyradoceras* Silurian, Devonian and "almost exclusively torticonic of the trochoceran type."

If *Trochoceras Halli* is a *Plectoceras*, there are at least two Canadian species of that genus, whose synonymy is as follows:

PLECTOCERAS JASON (Billings).

Nautilus Jason, Billings. 1859. Canad. Nat. and Geol., vol. iv, p. 464.

Plectoceras Jason, Hyatt. 1883. Proc. Boston Soc. Nat. Hist., vol. xxii, p. 268; and (1894) Proc. Amer. Philos. Soc., vol. xxxii, p. 498.

Types: three specimens in the Museum of the Geological Survey of Canada, that were collected by Sir W. E. Logan and James Richardson in 1856, from the "Chazy limestone" (not the Calciferous, as stated by Hyatt) of the Mingan Islands.

PLECTOCERAS HALLI (Foord).

Litutes undatus, Hall, pars. 1847. Palæont. N. York, vol. i, pl. XIII, figs. 1a and 1b (cat. excl.).

Trochoceras Halli, Foord. 1861. Cat. Foss. Cephal. Brit. Mus., pt. ii, p. 41, and p. 42, figs. 4 a, b.

Types: two specimens in the British Museum, from the Black River limestone at Lorette. Similar specimens in the Museum of the Survey are from Lorette and other localities in the Province of Quebec, as previously stated, and Mr. Walter R. Billings has found a specimen that seems to be referable to this species in rocks of the same age near Ottawa city.

The brief description of *P. obscurum*, Hyatt, unaccompanied

as it is with any illustration, is insufficient to show whether it is synonymous with *P. Foordi* or distinct therefrom.

In the Black River Limestone of Ontario and Quebec there are two other species of cephalopoda that may belong to the genus *Plectoceras*, though the few specimens that have yet been found of each do not give any indications of the shape or position of the siphuncle.

One of these is a large specimen from Kingston, Ont., and its immediate vicinity, of which the writer has seen three specimens. Two of these are still in the Museum of Queen's University, and the other has recently been acquired, by exchange, from the authorities of that institution, for the Museum of the Geological Survey. All three, upon the whole, agree very well with Emmons' two figures of *Inachus undatus*, and with Hall's representations of *Lituites undatus* on Plate XIII, fig. 1, and Plate XIII bis of the first volume of the Palæontology of New York. But the writer has not seen any Canadian fossil that exactly corresponds with the original of Plate XIII, fig. 3, of that publication, in which the siphuncle is represented as placed at a short distance from the venter, as in *P. Jason*. The two specimens in the Museum at Queen's show only traces of the surface markings, and the sutural line of one of them is curved concavely and shallowly backward on the side preserved, and not parallel to the obscure plicæ. The specimen now in the Ottawa Museum is a cast of the interior of the septate portion of the shell, five inches and a half in its maximum diameter, with fragments of the test attached. Its outer volution is subquadrate in transverse section, and the sutural lines are nearly straight on the sides but shallowly concave on the venter or periphery. It is doubtful whether these specimens should be called *Eurystomites undatus* (Emmons) as suggested by Hyatt, or *Plectoceras undatum* (Emmons).

The other is the *Gyroceras (Lituites) vagrans* of Billings (1857) from La Petite Chaudière Rapids, near Ottawa city, and near Mile End, Montreal. Of this species the writer has only seen two specimens, both from La Petite Chaudière. The more perfect of these is the type of the species, a very imperfect and badly pre-

served specimen, in the Museum of the Geological Survey. As Mr. Billings says of this specimen, it exhibits only "an artificial polished section passing through the central plane of the whorls, shewing clearly the construction of the tube to the apex, where it has a diameter of only one line; some of the septa and almost one-half of the transverse section; but neither the siphuncle, the character of the surface, nor the length of the produced oral extremity is indicated."

The attention of collectors in Kingston and Ottawa is called to these two very imperfectly defined species, in the hope that a renewed and diligent search at these localities would result in the discovery of specimens that are sufficiently perfect to establish their position among modern genera, and to more fully elucidate their specific characters.

Ottawa, Sept. 21st, 1903.

A ROBIN STORY.

EMERY PERRIN, Ottawa.

One early morning in the first week of June last, as I was standing at my bed-room window, facing the garden, I perceived a male robin which was literary dancing on top of the fence, while chirping loud without interruption.

On opening the window, I knew by the bird's antics and shrill voice that something was wrong, possibly with its mate, and that the brave fellow was actually *calling for help*.

I hastened down to the garden, and the moment the robin saw me it redoubled its efforts to attract my attention, flying to and fro and from me to the fence, as if to indicate that the trouble was on the other side of it. At which I concluded that some prowling cat must be in the very act of devouring the robin's mate or one of its young.

But no, there was no devouring being done yet. Only a big tom-cat was crouching on a pile of old lumber and watching from that point of vantage a poor female robin that was hanging by a piece of twine fastened to its broken leg from a heavy lopped-off plum-tree branch lying on the ground between pile and fence. The

cat appeared to be puzzled, on the one hand, by the whirling of the captive bird, and somewhat intimidated, on the other hand, by the frantic appeals and plucky showing of the male robin.

All this I saw in the twinkling of an eye

Jumping over the fence, I took hold of the captive bird with my right hand and of the rather cumbersome branch with the left, and tried to cut the twine with my teeth, as I had no knife with me at the time ; but in this I was unsuccessful. So, retracing my steps over the fence with bird, branch and all, I reached my shed, where I knew there was a pair of scissors, with which, on second thought, I severed, not the twine, but the mere shred of skin that still held together the dislocated leg of the bird, and so released the latter.

After a few gentle strokes of the hand upon its back, I let the now crippled robin take its flight. It alighted first on the ground in the garden, and remained there for a few minutes, regaining its wind and strength. Then it perched itself on one of the plum-trees

After relating the above facts to my people at the breakfast table, my sister and I repaired to the garden, where to our utter amazement and delight we beheld the crippled robin bathing its stump in a pail (which I had previously filled with water) by *sitting* on the brim of the pail and lowering itself so as to reach the refreshing liquid. And that it did repeatedly in our presence, when we were but a few feet away from it

Finally my sister wanted to capture the poor thing, so as to nurse its amputated limb, and she made a move in that direction, but the wounded robin flew away with its male companion who had been around all the time, giving vent to its fear by repeated notes of anguish, and it was not seen any more.

THE ENTOMOLOGICAL SOCIETY OF ONTARIO.

The Fortieth Annual Meeting of the Entomological Society of Ontario was held in Ottawa, on Thursday, Friday and Saturday, the 3rd, 4th and 5th Sept., 1903. Among those present were Prof. W. Lochhead, Ontario Agricultural College, Guelph, President of the Society; J. D. Evans, Vice-President, Trenton; W. E. Saunders, London, Secretary; Dr. L. O. Howard, U. S. Entomologist, Washington, D.C.; Rev. Dr. Bethune, London; H. H. Lyman, A. F. Winn, C. Stevenson, G. A. Moore, and A. E. Norris, Montreal; J. B. Williams, Toronto; Dr. James Fletcher, Arthur Gibson, C. H. Young, W. H. Harrington, Dr. Blackadar, Dr. C. Guillet, T. J. McLaughlin, and other residents of Ottawa.

On Thursday morning a meeting of the Council was held, and during the afternoon, beginning at 2.30, the reports of the Council, District Directors, Delegate to the Royal Society, and of the Montreal, Toronto and Quebec Branches of the Society, were presented. The reports of the Directors dealt chiefly with outbreaks of injurious insects in the different Districts represented, while those from the Branches reviewed the work carried on during the year.

The first paper on the programme was one by Rev. Dr. Bethune, of London, Ont., "A menace to the Shade trees of London, Ont." This made mention of the presence, particularly on maple trees, of millions of the Cottony Maple Scale. These insects occurred in great numbers along the lower sides of the branches, resembling large woolly deposits on the trees, being very unsightly and at the same time injurious. Mr. H. H. Lyman, of Montreal, read a paper "Two Remarkable Aberrations (Lepidoptera)," in which he recorded the capture in Montreal of a most beautiful form of *Spilosoma virginica*, which was clearly and definitely banded with black, as in *Colias philodice*, and one of *Melitæa phæton*, which lacked the white spots above. A paper "Additions to Quebec Syrphidæ," by Mr. Gus. Chagnon, was presented, and gave interesting new records of the collection in that province of flies belonging to this family.

On Thursday evening in the Assembly Hall of the Normal School, the President, Prof. W. Lochhead, delivered his inaugural address, "The Progress of Entomology in Ontario." This was a practical address, very suitable to the occasion, and contained

much useful information as to the important part which had been played by the Entomological Society in developing economic entomology in Canada. He divided the history of the Society into three periods, referring to the excellent work which had been performed during these periods by some of the prominent workers whose names were now so well known in connection with the Society.

Following Prof. Lochhead's address, Dr. L. O. Howard, U. S. Entomologist, gave a succinct statement as to the Transmission of Malaria and Yellow Fever by Mosquitoes. This presentation of a subject which is now acknowledged to be one of the greatest discoveries of the latter end of the last century, was treated in such a plain and delightful manner by the eminent lecturer, that it is no exaggeration to say that the whole audience sat spellbound during the half hour, which seemed to be only a few minutes, so keen was the attention. After these two speeches another half hour was taken up with answering the many questions bearing on the latter subject, which were asked by many of those present. It is greatly to be regretted that so few of the medical profession were in attendance. Knowing the intense interest of this subject to them and its bearing on the well being of the country at large, every doctor in Ottawa had been specially and individually asked to be present.

On Friday morning the Society met early, and many valuable papers were read and discussed. Dr. Howard spoke of "Recent Work in American Economic Entomology," and gave an account of the excellent work on the Cotton Boll Weevil which had been performed by the officers of his department, and pointed out the large saving in actual money which could be made in similar cases by the application of definite scientific knowledge.

"Insects Injurious to Crops in Ontario in 1903" were dealt with, together with the remedies which had been found most effective in saving loss, by Prof. Lochhead, of Guelph, and Dr. James Fletcher, of Ottawa. Prof. Lochhead also read a paper on "The Present Status of the San José Scale Question in Ontario," and showed plainly how serious a matter the presence of this insect in the Ontario orchard of the Niagara and St. Catharines Districts really was. Insects Injurious to the Basswood tree, were treated by Mr. Arthur Gibson, of Ottawa.

On Friday afternoon further papers were presented. Dr. Fletcher read a draft of the Entomological Record for 1903, pointing out the advantage to working entomologists of this record and urging that the different families of insects should be treated of by specialists. Dr. Fletcher also read "Notes on the Life histories of two rare Manitoban Moths, *Apocheima rachelæ* and *Leucobrepheos middendorfi*," the eggs of both of which had been received from Mr. Norman Criddle, of Aweme, Man. Rev. Dr. Bethune read a note on the occurrence of the beautiful Leopard Moth, *Ecpantheria scribonia*, at London, Ont., a larva of this species having been found by him and sent to Ottawa, where the moth was reared. Mr. Arthur Gibson read "Further Notes on the Larvæ of Canadian Tiger Moths, of the Genus *Apantesis*." Three cases showing the moths and inflated larvæ in various stages, were exhibited in illustration of this paper and were very much admired by all present at the meeting. "Notes of the Season in Western Quebec," were given by Mr. Charles Stevenson, of Montreal.

Specimens of remarkable and rare insects were exhibited during the meeting by the members present. An interesting feature of the meetings was the discussion of each paper as it was delivered. Every meeting was open to the public, and it is surprising that so few members of our Club availed themselves of the opportunity of learning something about beneficial and injurious insects. Through the kindness of the Ottawa Board of Trade, the day meetings were held in their commodious and very comfortable room on Elgin street.

On Saturday morning a visit was made to the Division of Entomology at the Central Experimental Farm, where a very pleasant hour or two was spent in examining the collections under the guidance of the Entomologist and his assistants. At 12 o'clock the visitors were driven all around the Farm, and at 1 o'clock were entertained by Miss Dorothy Fletcher, to an *al fresco* lunch in the Botanic Garden. The afternoon was spent by such members as could remain, in an excursion to Dow's Swamp and the Rideau River. Dr. Fletcher who accompanied the party pointed out localities of special interest, and although, owing to the weather, few specimens were secured, everyone was well satisfied with the outing.

FIRST AUTUMN SUB-EXCURSION.

A most successful sub-excursion—the first held this autumn—took place on Saturday afternoon, September 26th. About 50 members and friends of the Club, including many of the Normal School students, left the pavilion at Rockcliffe under the guidance of the President, Mr. W. T. Macoun, and spent a most delightful afternoon in the woods around Rockcliffe, Mackay's Lake and Beechwood. The weather was perfect for such an expedition. The beauty of the autumn woods called forth many appreciative exclamations of wonder, and one pair of hands could hardly hold the many treasures gathered by every member of the party. The company very soon broke up into three groups, one going with Dr. Ami to study the fossils near the river. The main body followed the President along the eastern shore of Mackay's Lake, where they studied the trees and shrubs, of which there is there great variety. A smaller party went with Mr. Attwood, Dr. Whiteaves and Dr. Fletcher around the western shore. Afterwards both parties joined in the woods near Beechwood. Here short addresses were delivered by the President and Dr. Fletcher. Special attention was directed to forest trees, berries and other fruits. The distribution of plants was illustrated by the various kinds of burs, of which a large and representative collection was available on the clothes of the excursionists. Some rare ferns were collected and exhibited such as *Pellaea gracilis*, the Rock Brake, *Asplenium angustifolium*, and *Aspidium Goldianum*. Simple characters were given by which the different families of ferns could be recognized. The great rarity found was the curious Peloria state of the Common Toad-flax, *Linaria vulgaris*. Violets, which have been so carefully studied in this locality, also came in for some attention, and the inconspicuous cleistogamous flowers and autumn fruits of several species were shown, including *Viola Dicksonii* with its underground fruit, and pods which had been formed underground and had then pushed their way to the surface two or three inches from the main stem. The automatic distribution of the seeds of violets by the contraction of the strong valves of the pods was explained. The autumn flowers of the Canada Violet were much admired. The hibernation of insects came in for some attention, the caterpillar of the Isabella Moth serving as an illustration. The gay caterpillar of *Cucullia asteroides* was found on *Aster cordifolius*.

BOOK NOTICE

BOTANY—THE ARTIFICIAL CULTIVATION OF TRUFFLES.

Boulanger, M. Emile. Germination de l'Ascospore de la Truffe: 4to. pp. 20, 20 plates, Paris, France, 1903.

Until quite recently, as may be seen in books of botany, the early stages of the Truffles were unknown. This, however, owing to the skill and careful work of the author of the above pamphlet, is no longer the case. Mr. Boulanger has recently given us the results of his patient scientific studies on the germination of the spores of two species of edible truffles, and there is no doubt that, before long, developments of great economic importance in the cultivation of these fungi may be the outcome of his studies. One of the species used by Mr. Boulanger in his investigations is the Black-spored Truffle (*Tuber melanosporum*), which is the truffle most highly valued by epicures; the other the Hook-bearing Truffle (*T. uncinatum*), although also edible, is less esteemed.

The author in 1898 first obtained the germination of the spores in sterilized water, and from these, on slices of cooked carrots sunk in the earth, he grew the mycelium or spawn. This was afterwards produced on the earth itself and on other media; then, finally, from the mycelium he succeeded in growing fully developed truffles in his laboratory. These, it is true, lacked the characteristic taste and smell which give truffles their gastronomic value; and, moreover, they were misshapen; but, nevertheless, they were true adult perithecia of *Tuber uncinatum* containing normal asci.

The next step was to try the practical cultivation of the fungi in the open air under the conditions in which truffles grow in nature. This was done in 1900 on seven acres of an old oak forest at Etampes, near Paris; pieces of raw carrot impregnated with the spawn were buried at the base of oak trees and a special fertilizer (6 per cent. potassium sulphate and 6 per cent. superphosphate of lime) applied on the surface of the soil. On the 7th May, 1903, specimens of truffles of the second crop from these cultures were exhibited by Mr. Boulanger at the meeting of the Mycological Society of France. These specimens grown under natural conditions out of doors, it may be remarked, had the fully developed aroma and taste of commercial truffles, although, as stated above, those grown in the laboratory from similar stock did not develop those important characteristics.

Two fine plates accompany the pamphlet and show the spores in the different stages of germination. This work is an important contribution both to science and horticulture.

J. A. G.

NATURE STUDY—No. VI.

NATURE STUDY WITH ADVANCED CLASSES—AN EXPERIMENT.

Prof. W. LOCHHEAD, Guelph, Ont.

Bailey has said: "When the teacher thinks chiefly of his subject, he teaches a science; when he thinks chiefly of his pupil, he is probably teaching Nature Study." This sentence puts in a nut-shell the proper *attitude* of the teacher of Nature-Study, but it should also be the attitude of every teacher who claims to *educate*, no matter whether he is dealing with pupils in the public schools, or with students in the colleges and universities. It must be admitted that the framers of the courses, and the teachers as well, in most of our colleges, lay too great stress on the subject-matter, and leave out, to a large degree, the student. Of all colleges, an agricultural college should be the best school for the study of Nature,—and for Nature-Study as well, if there is a real distinction; for from the outset the attention of the student is directed towards the soil, the plant, and the animal; yet, it must be confessed that the method of instruction in some of these colleges is still 'largely a reflection of mediæval practices and ideals.'

For some time past the writer felt that the studies of the regular session dealt too much with laboratory collections and with books, and too little with out-of-door subjects. He felt also that the student should acquire the "habit of observing and seeing for himself and at his best, without books or help, in the presence of the facts and in the open air." It is true that the in-door method of investigation is an adaptation to meet unfavorable conditions. The regular session of the Ontario Agricultural College does not begin until the middle of September; winter sets in about the first week of November; and the session closes on the 15th of April. There is therefore little opportunity for thorough out-of-door studies during the regular session.

To remedy this state of affairs, a two months' course in Nature-Study was given at the College, for the first time this year to the students of the Third Year. This course began on the 20th of April, and continued until the 15th of June.

As the students were already familiar with the elementary facts of botany, physics, entomology, and zoology, the method of in-

struction was of course different from that usually adopted in our Public and Normal schools. The instructors gave no set of lectures ; they acted as guides, and suggestors of lines of investigation. The topics assigned to each student for investigation related as far as possible to matters of economic importance to the agriculturist ; for it was believed that such investigations would carry out the dual purpose of Nature-Study, which is : first, to "develop an attitude—a power of interpretation and appreciation of nature, a power of self-expression which will enable the student to gain a better control of himself and his surroundings, to live a fuller life, and to be of greater service to society than he otherwise would be" ; and, second, to gain that intimate knowledge of nature which will make men better able to cope with their living environment, or, in other words, for its economic usefulness.

From the very outset, the subjects assigned to each student could be studied best at that particular season ; for the writer believed strongly that Nature-Study should be taken up from a seasonal standpoint. Every student had to show the results of his studies in careful drawings and well-kept notes. For the first two weeks all the students took the same work, but for the remainder of the term individual work was the rule. Classes were formed for the study of birds every morning, and besides, excursions were made to the museum. Excursions took place also for the study of the structure and habits of the forest trees, the spring plants, the life of ponds and streams, and the common insects of the orchard ; as well as the study of the different soils of the Farm, and the rocks of the neighborhood.

Particular attention was given to the study of the winter buds and twigs of our common shrubs and trees. Keys were made for the determination of the common shrubs and trees on the College campus by means of their winter buds.

Following were some of the topics assigned : Recognition of trees and shrubs by the winter twigs and buds ; the story of an apple twig ; a study of the fruit-spurs of our common orchard trees and shrubs ; a study of trees, from a distance and at close range ; a study of germinating seeds ; a study of the wood of dicotyledonous trees ; a study of the wood of coniferous trees ; recognition of grasses by their leaves ; studies of the sundew ; studies of the

rosaceous family ; the development of the apple and cherry ; studies of the heavens at night ; the story of the dandelion ; the development of the frog ; the life-history of mosquitoes ; studies of snails and slugs ; the habits of the common birds (about 60 were identified during the term) ; studies of the currant-worm ; development of barberry and wheat rust ; lady birds ; a soil survey of the Farm ; the grasses of Guelph ; insects and plants ; etc.

Throughout the whole course every student was compelled to record daily in the "Nature-Study Journal" some observation which he had made during the day. This Journal was carefully inspected every day by an instructor, in order to determine the accuracy of the descriptions of the observations made by the students. As the term wore on, the observations were given in greater detail.

For the first two weeks of the term the class met for an hour every day at two o'clock. At first the time was devoted mainly to explaining the written instructions given out to the students, and to encouraging the observers. Later, however, two of the students were selected every day to report the results of any investigation which they had concluded. The object of this was to give them facility in expressing their ideas before an audience.

It is likely that some of the students who took this Nature-Study course at the Agricultural College will sooner or later become teachers of Agriculture, and perhaps Nature-Study, in either the Public or High schools of this province. In the writer's judgement, the knowledge of plants, animals, earth, and sky is absolutely necessary to the teacher who essays to teach Nature-Study. It appears to be of greater importance than the knowledge of the psychology of the child. It is probable that the teacher, who is himself a nature student, has gained through his own experience an insight into the best way of interesting the child, such as he could never obtain in any other way. A teacher may have a knowledge of child-nature, but if he has not a knowledge of nature as a part of his environment, it will be next to impossible for him to maintain for any length of time, in a direction which will be educative, the child's natural interest in its surroundings. How can a teacher train the child to use the materials of knowledge, such as plants and animals, in the proper development of the

phases of its being, if that teacher himself cannot use the materials of its knowledge?

That this Nature-Study course was a success, was the verdict of the whole class. Although it ran into the holidays of the student, who usually places a high value on his holidays, yet every member of the class considered that the time had been well spent, and that they had got a glimpse into nature that will ever remain as a refreshing picture. Most of the students were the product of our Public and High school system, and had to a certain extent lost their independence. They had been spoon-fed too much, and were practically unable to investigate and verify facts for themselves. This Nature-Study course delivered them from this bondage; it made them investigators and have opinions of their own. To the writer the work seems of great value, not only for the information the students obtained at first hand, but for the attitude which it developed and the point of view obtained. The writer was not teaching botany, entomology, and geology; he was teaching plants, insects and fields.

The Nature-Study course will be given again next spring; and, if it proves satisfactory, will become a permanent feature of the Third Year.

As advocates of Nature-Study we all have one common object in view. Human as we are, our methods will be as varied as our minds, and methods are not the be-all and the end-all of education. With some of us, our methods may lead some authorities to believe that we are furnishing information chiefly; with others, methods may be over-done, too much attention being given to the cultivation of the Nature-Study *attitude*, and too little to the useful side. There is a happy medium, but only the very best teachers can hope to attain to that stage of perfection. It is clear, nevertheless, that, whatever mistakes may be made at the outset as to methods in the introduction of Nature-Study, "the essence of it," in the words of Bailey, "can never pass away, because it is fundamental to the best living."

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