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JULY, 1904.  
VOL. XVIII, No. 4

# THE OTTAWA NATURALIST.

Published by the Ottawa Field-Naturalists' Club.

## CONTENTS.

	PAGE
1. On the Squamoso Parietal Crest of Two Species of Horned Dinosaurs from the Cretaceous of Alberta, by Lawrence M. Lamb . . . . .	81
2. The Mountain Bluebird in Manitoba, by Norman Criddle	85
3. Note on the Food Value of Certain Mushrooms, by Frank T. Shutt . . . . .	87
4. General Excursions . . . . .	89
5. Conchological Notes . . . . .	91
6. Nature Study—No. 15.. . . .	93

(ISSUED JULY 7, 1904.)

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# THE OTTAWA NATURALIST.

VOL. XVIII.

OTTAWA, JULY, 1904.

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## ON THE SQUAMOSO PARIETAL CREST OF TWO SPECIES OF HORNED DINOSAURS FROM THE CRETACEOUS OF ALBERTA.

By LAWRENCE M. LAMBE, F.G.S., F.R.S.C., (With two plates.)

One of the most interesting features of the fauna of the Belly River series of the Cretaceous of the West is the presence of Ceratopsids more primitive than those of the Laramie. Of the former the writer, in the second part of volume III (quarto) of Contributions to Canadian Palæontology, 1892, described three species of *Monoclonius*, viz. *M. dawsoni*, *M. canadensis* and *M. belli*, all from the Red Deer river district. In a further study of the type material on which *M. dawsoni* was founded, it became apparent that two species had been included under one name and also that the species distinct from *M. dawsoni* probably represents a new generic form. The material denoting the new genus and species, and originally referred to *M. dawsoni*, consists of a large posterior crest (p. 59, fig. 15, op. cit.), with which was found a nasal horn core. This crest is unique in having hooked-processes developed on the posterior border.

For the form represented by the crest with hooked-processes the generic term *Centrosaurus* is proposed and the name *apertus*, in reference to the large fontanelles, is deemed an appropriate one for the species.

In a paper by the writer, to be published shortly, a detailed description with figures will be given of the posterior crest of *Centrosaurus apertus* as well as of that of *Monoclonius canadensis*. The skull, described in the above mentioned memoir, p. 57, fig. 14, cat. No. 1173, is retained as the type of *Monoclonius dawsoni*.

The fontanelles of the crest of *Centrosaurus apertus* are included entirely within the parietal part of the expansion, those of *Monoclonius canadensis* are bounded on the outer side by both the parietal and the squamosal.

The crest of *C. apertus* is composed principally of the coalesced parietals which form an expansion having somewhat the shape of a saddle, broader than long and much more robust posteriorly than in front where the bone is decidedly thin. The squamosal is not known. The parietal part of the expansion, figures 1 and 2, plate I, is longitudinally ridged in the median line, is broadly expanded laterally on either side, and ends posteriorly in a robust transverse bar that is concave in outline behind as viewed from above. The fontanelles occur one on either side of the median line and are of large size: they are bounded behind by the transverse bar that forms the posterior border of the crest, and laterally and in front by the thin side extensions. Along the median line the bone is transversely concave beneath. The separate ossifications, named by Marsh epoccipitals, are well developed in four pairs, with in addition the pair of hooked-processes, already mentioned, which are regarded as specially developed epoccipitals. The alar extensions are referred to in the original description as the squamosal portion of the crest, the squamosals being then regarded as having coalesced with the parietals. Near the anterior border of the right extension, however, there is a definite line of demarcation, *a*, figures 1 and 2, which can be considered only as the suture for the squamosal. The writer's attention was drawn to this suture, and to the wrong interpretation in the original description of the nature of the side extensions, by Mr. J. B. Hatcher, Curator of the Department of Vertebrate Palæontology of the Carnegie Museum, Pittsburgh, who, with his intimate knowledge of the *Ceratopsidae*, is justly regarded as one of the foremost authorities on this interesting family. The postfrontal suture, *b*, figures 1 and 2, extends from the inner side of the anterior end of the fontanelle obliquely forward and inward to the median line in front. Numerous impressions of blood-vessels are present on and in the neighbourhood of the epoccipitals and hooked-processes, and on the upper surface along the median ridge. The thickness of the bone at a number of points, is indicated in centimetres by the numerals in figure 1.



The horn core, figure 3, found with the crest is presumably a nasal one. It is straight, and laterally compressed so as to be lenticular in cross section presenting a sharp edge to the front and rear. A somewhat similarly shaped nasal horn core has been described by Cope under the name *Monoclonius sphenocerus*. One side, that figured, is deeply channelled longitudinally, the other is more regularly convex; vascular markings are conspicuous on both sides. There is apparently no great distortion, if any, of the specimen, which is 30 centimetres long and imperfect at the tip and below.

We may conclude from the above that *Centrosaurus apertus* had a broadly expanded squamoso-parietal crest composed mainly of the coalesced parietals, the squamosals being confined to the antero-lateral edge of, and taking but little part in the formation of, the frill. That the large oval fontanelles were included entirely within the parietal part of the expansion and that epoccipital bones were well developed, of which the hinder pair were greatly modified so as to form large hooks or spurs of bone on the hinder border. That a closely fitting integument was present, as is indicated by the many impressions of blood-vessels on the upper surface, with the probability that the projections of the periphery at the sides and behind were sheathed in horn.

The squamoso-parietal frill of *Monoclonius canadensis* is represented by a well preserved right squamosal, figures 4 and 6, and part of the parietal, figures 5 and 7. With these were found other parts of the skull, to which reference has been made in the original description.

The squamosal is plate-like, somewhat triangular in shape, with the apex of the triangle directed backward. The inner border is concave in outline, the outer one convex and scalloped. The front border has two deep emarginations in its outer half; in the inner half are the sutures for the jugal and postfrontal. Its upper surface is smooth. Beneath is a deep pit, *c*, figure 6, which received a process from the quadrate, and at a slightly lower level the outer end of the exoccipital probably effected a junction where the broken surface is indicated at *d*. A shallow groove, *f*, figures 6 and 4, extends from the raised surface for the exoccipital to and over the inner border to the upper surface where it ends; it becomes deeper and narrower near the border. There is a wide triangular excavation in the inner front portion of the lower surface with indications that the bone here overlapped the postfrontal to some extent, the contact with the jugal being limited to a small surface which would include the marginal pit shewn in figure 4 at *e*.

The parietal reached the squamosal from behind by means of an attenuated lateral extension of which only the anterior extre-

mity is known. This part of the parietal is keeled below, figure 7, and is triangular in cross section, with a flat upper surface, figure 5, that fits into a shallow groove along the inner posterior border of the lower surface of the squamosal as shewn by the dotted lines in figures 4 and 6. Its free outer border behind continues the sinuous curves of the outer border of the squamosal. The parietal portion of the crest of this species may have had some resemblance to the coalesced parietal bone, the only known part of the crest, of *Monoclonius belli*.

On the inner side of the squamosal and the forwardly directed posterior extension of the parietal was an opening in the crest of great size much larger probably than the parietal fontanelle of *Centrosaurus apertus*.

From the foregoing it is seen that the posterior crest of *Monoclonius canadensis* extended far back, that it was made up of the parietals (probably coalesced and bearing some resemblance in form to the corresponding portion of the frill of *M. belli*) and the squamosals, the latter entering largely into its composition, and that fontanelles of very large size were present. We find also that the fontanelles were not included entirely within the parietals, as in *Centrosaurus apertus* but were bounded laterally in front by the squamosals.

#### EXPLANATION OF PLATES.

##### PLATE I.

- Figure 1—Coalesced parietals of *Centrosaurus apertus* viewed from above; one-eighth natural size.  
 Figure 2—The same, viewed from the right side and similarly reduced.  
 Figure 3—Lateral aspect of nasal horn core of *C. apertus*; one-eighth natural size.

##### PLATE II.

- Figure 4—Right squamosal of *Monoclonius canadensis*, exterior view; one-sixth natural size.  
 Figure 5—Upper surface of front end of right lateral posterior extension of parietal of *M. canadensis*; similarly reduced.  
 Figure 6—Interior view of the squamosal shewn in figure 3; similarly reduced. The dotted line in this figure and in figure 4 indicates the position of the parietal extension when applied to the squamosal.  
 Figure 7—Lower surface of the bone shewn in figure 5; similarly reduced.

## THE MOUNTAIN BLUEBIRD IN MANITOBA.

By NORMAN CRIDDLE, of Aweme. Man.

In an interesting paper on "Rare Manitoba birds," read before the Historical and Scientific Society of Manitoba, on February 9th, 1904, by Mr. G. E. Atkinson and published in the Manitoba Free Press, mention is made of two Mountain Bluebirds (*Sialia arctica*) having been seen in October, 1896, near Brandon, one of which was shot. These are apparently the only records of the bird's appearance in Manitoba, excepting a few notes on their migration sent by me to the United States Biological Survey.

This bird is, however, by no means uncommon in the tract of country lying between this place and Carberry—known locally as the "Sand Hills" or "Spruce Bush"—and it seems probable that, when its favourite haunts are more generally known, it will be found in several of the more hilly parts of the province.

The "Sand Hills" mentioned above consist of low sandy hills, very often with blow-outs on their south sides and underbrush on the north. These hills, which seldom rise more than forty feet above their bases, usually contain on their tops and sides—when protected from fire—clumps of spruce, and between their ranges—that contain an occasional pond—grow aspen, willows and a few stunted oaks, etc.

These oaks which are often hollow, in company with a few old stumps that have been previously used by woodpeckers, make ideal nesting places for the bluebirds, and any person in search of them during the latter half of June, would probably find several nests in a day.

Of the numerous nests examined by me, some were more than nine feet from the ground, the average being just under four. They were built of dead grass and contained, when the birds had finished laying, six eggs, which closely resemble those of *S. sialis*, excepting that they are smaller.

The reason that these birds are not more generally known in Manitoba, seems to be their habit of seldom flying far from their breeding ground. As an instance, I have lived within five miles

of their nesting places for over twenty years without seeing one here.

My migration notes are unsatisfactory. The earliest arrival was noted May 7th, 1900, the last noted being October 14th, 1899, and October 16th, 1900. These dates could probably be extended both ways, as they are taken after only a few hours spent in the "Sand Hills" with long intervals between each visit.

For the benefit of readers that are not acquainted with the different bluebirds of North America, the following distinguishing features of our Canadian species may prove of interest:

**BLUEBIRD** (*S. sialis*). Male: above azure blue; throat and breast rusty brown; belly whitish. Female: blue of back more grayish brown; breast less rusty. Male in winter much the same as female.

**WESTERN BLUEBIRD** (*S. mexicana occidentalis*). Male distinguished from *S. sialis* by having rusty brown on fore back and the throat blue. Female duller. The range of this species is given in Chapman's Colour Key, as "Pacific coast from Northern Lower California north to British Columbia," etc.

**MOUNTAIN BLUEBIRD**, (*S. arctica*). Male: above bright blue; throat and breast rather paler; belly whitish. Female: above bluish gray, with very slight brownish tint; rump blue; throat and breast bluish buff; belly white. The specimens observed closely by me seem to be distinctly bluer than the description in Chapman's Colour Key. This species is said to breed from "Sierra Nevada east to the plains, and from New Mexico north to the great Slave Lake region."

There is practically no difference in the length of these three birds.

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## NOTE ON THE FOOD VALUE OF CERTAIN MUSHROOMS

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By FRANK T. SHUTT.

In the minds of most of us, no doubt, mushrooms are regarded rather as a delicacy than as an article of food. Their peculiarly agreeable and somewhat piquant flavour when properly prepared and carefully cooked has established for many species of edible fungi a world-wide reputation for the making of ragouts, sauces, and as "flavourers" generally; but, speaking broadly, most have failed to recognise their highly nutritious character. Their price in city markets is undoubtedly out of all proportion to their value as food, but we must conclude that the well-nigh general neglect to gather and use them in districts where they occur in abundance, is due chiefly to ignorance of their nature from the standpoint we are now considering them.\*

Analysis shows them to be characterized by a comparatively speaking large percentage of nitrogenous matter (crude protein), a considerable proportion of which exists in the form of true protein or albuminoids. The function of this latter class of constituents of foods is to repair the daily waste of the body and build up its tissues, and hence the proteids are commonly known as flesh-formers, and are consequently to be regarded as the most important of the nutrients, whether in animal or vegetable foods.

Last autumn, in order to obtain data that might be of interest in this connection, a partial analysis was made of certain species that are found in abundance on the lawn of the Experimental Farm, Ottawa. These comprised the Fairy-ring Champignon (*Marasmius oreades*), the Grey Coprinus or true Inkcap (*Coprinus atramentarius*), and the Shaggy Coprinus or Horse tail Mushroom (*Coprinus comatus*), commonly known as "Umbrellas". The results are as follows:—

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\*There are, we know, many persons who have a dread of all fungi, for fear of being poisoned, and it is only natural that they should hesitate to avail themselves of these nutritious delicacies.



Collected Oct. 14th., 1903.	Dry Matter. per cent.	Crude Protein. per cent.
1. <i>Marasmius oreades</i> , mature ...	10.15	4.07
2. <i>Coprinus atramentarius</i> . . . . .	5.67	1.37
3. " <i>comatus</i> , immature ...	9.10	2.97
4. " " mature ...	6.77	2.71
5. " " old, but firm	6.14	1.36

In the case of the *Marasmius*, it was found that 70 per cent. of the crude protein was present as albuminoids. Of the crude protein in mature *C. comatus* (No. 4), 68 per cent. existed as albuminoids, a percentage that was reduced to 48 in the older specimens of the same species (No. 5). Unfortunately, by reason of insufficient material, the proportion of albuminoids in the crude protein of Nos. 2 and 3 could not be determined.

When it is pointed out that but few of our commonly used vegetables and salad plants contain more than 10 per cent. to 11 per cent. dry matter—and many of them, as vegetable marrow, celery, lettuce, cucumbers, &c., do not possess much more than half such an amount—it will be obvious that mushrooms are worthy to rank with these most useful articles of diet. But it is not merely in dry matter that the edible fungi make their claim to recognition as a food. This dry matter is highly nitrogenous. Our data on this point are very clear. Further, these analyses indicate that the greater part of this nitrogenous matter exists in the more valuable form of albuminoids. In this respect, mushrooms are without doubt much superior to vegetables and fruits.

If time permits, this work will be continued during the coming season. There are many other species of edible fungi in abundance, in addition to those mentioned in this note, and we hope, as opportunity offers, to ascertain their relative food values. We, further, wish to examine these mushrooms at various stages of growth, for the results from the *C. comatus* here given would indicate a falling off in nutritive value after reaching a certain degree of edible maturity, due to decreasing dry matter and albuminoids. This may only occur in the deliquescent fungi, but it will be interesting to have further data upon what must be considered a point of both scientific and economic importance.

Laboratory, Experimental Farm, Ottawa, May 1st, 1904.

## GENERAL EXCURSIONS.

The Ottawa Field Naturalists' Club held the first general excursion to Casselman on May 21st. The president, Mr. W. T. Macoun, was in charge, and leaders in various branches of the Club's work were present, but the heavy rains of the preceding days limited the attendance to a few members of the Club.

The collecting field at Casselman is a most varied one, and the different sections soon separated for the day's work. Dr. Ami took a party along the bank of the Nation River, and they were successful in unearthing numerous relics of the South Nation Indians, an Algonquin tribe whose name is borne by this tributary of the Ottawa river.

Dr. Fletcher, Messrs. Gibson and Young led the entomological section and secured many specimens of insects, among them 10 different species of butterflies. *Thecla niphon* was, perhaps, the rarest of these. This is a small brown butterfly the caterpillar of which feeds on the young shoots of pine trees. A specimen of the rare beetle *Hylecæus lugubris* was seen on the railway track and was caught but made its escape. Several specimens of *Sphæridium scarabaeoides* were secured.

The ornithologists found that both locality and season combined to furnish ideal conditions. No less than forty-nine species of birds were observed by Rev. C. W. Eifrig. The Greater Yellow-legs and the Black-bellied Plover were both seen along the river. A Migrant Shrike's nest with five young and one egg was found. The nest was placed on one of the lower branches of a plum tree. A Bluebird's nest with 5 eggs and a nest of the Savanna Sparrow were also seen.

The botanical section found several species that are not of common occurrence near Ottawa. Four species of *Trillium* were collected, the rarest being *Trillium cernuum*. *Trillium grandiflorum* with exceptionally large flowers was common. In some of these the white petals from the base to the open measured  $2\frac{1}{2}$  by  $1\frac{1}{2}$  inches wide. Specimens in one clump were semi-double and had in some instances the sepals petaloid and more or less white. Some violets were in splendid condition. *Viola brauda* was remarkably fine and in such enormous abundance as to scent the

air. *Viola affinis* grew in the crevices of the rocks beside the river. In a creek bottom *V. cucullata* was very beautiful. *V. prionosepala* was also collected at the edge of the woods as well as *V. Dicksoni*. *Corylus Americana* was added to the flora of the district, by Prof. Macoun. Dr. Fletcher found an interesting hybrid between *Osmunda claytoniana* and *Osmunda cinnamomea* growing in a clearing where both of these ferns were very abundant. The strawberry blossoms (*Fragaria Virginiana*) presented a strange appearance in one place; the petals were modified so as to bear anthers at their tips, and could be seen in all stages of transition from petals to anthers. Although spring only began on the 1st of May, this season's growth has been very rapid.

The Ostrich Ferns in the alluvial soil of the river bottom were fully five feet in height, and so dense as to resemble a picture of tropical vegetation. *Phlox divaricata* was found; but the splendid beds of this beautiful flower which formerly occurred on the south bank of the river have been almost destroyed by the forest fires—On the north bank clumps of *Rudbeckia laciniata* were found in one spot. The only land shell of interest was *Helix Sayi*.

The SECOND GENERAL EXCURSION was held on May 28th to Gilmour's Grove, Chelsea. Through the kindness of Messrs. Gilmour and Hughson, the beautiful grove overlooking the grand rapids on the Gatineau River was thrown open to the club, and about 200 members and their friends took the opportunity of again investigating this rich locality. The day was simply perfect for such an outing, and many interesting specimens rewarded the collectors. Mr. Arthur Gibson and Mr. D. A. Campbell captured many insects of interest; among these, *Thecla niphon*, *Amblyscirtes samoset* and *Nisoniades juvenalis* may be mentioned. The botanical treasures as usual were most numerous among the collections. *Cypripedium acaule* was found in small numbers; other orchids exhibited at the end of the day were *Orchis spectabilis* with the whole flower purple, and *Habenaria Hookeri*; *Viola prionosepala* carpeted the woods in one place. A prize offered for competition by Miss Cowan for the largest number of species observed, was won by Miss Constance Anderson. Several ferns were collected, and Miss K. Lee exhibited fine plants of *Woodsia Ilvensis*, and *Asplenium Trichomanes*. Dr. Fletcher showed a specimen of *Botrychium matricariaefolium*, of species which had only once before been found in the district, at Casselman, many years ago.

At 5 o'clock the President, Mr. W. T. Macoun, called the meeting to order and the usual addresses were given. Mr. Macoun spoke shortly of the objects of the club and urged the claims of the club for more general support by all interested in Natural History and Nature Study. He spoke also of some of the trees growing in the locality. Dr. Fletcher spoke of some of the plants collected and gave information about specimens handed in.

Mr. D. A. Campbell spoke of and exhibited some of the insects collected during the afternoon and dealt with the habits of tiger beetles, dragon flies and other insects, also with the methods of collecting, killing and preserving insects.

Dr. S. B. Sinclair spoke of the pleasures to be gained from such meetings as the club gave opportunities for, and at his request the party had the pleasure of hearing the ladies and gentlemen of the Normal School present sing "Sweet and Low," which was done with great taste and was much enjoyed by all.

Mr. Congdon, of Malone, N. Y., on invitation of the President, expressed his pleasure at being a participant in the excursion and of the value of Nature Study to which he had given some attention in his professional work as a teacher. T. E. C.

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## CONCHOLOGICAL NOTES.

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### MARGARITANA DELTOIDEA.

Some years ago, while looking over a box of "dead" shells collected in the Rideau Canal above Hartwell's Locks, I was surprised to find among them a single specimen of *Margaritana deltoidea*. Although the species might from its known range be expected to be found in the vicinity of Ottawa, I concluded, as I had not observed it previously, that the specimen must have been placed with the canal shells by the busy but unscientific little hands that occasionally find occupation in my cabinets. I was confirmed in this conclusion by the fact that a search, made under favorable conditions in the locality in which the box was collected, was fruitless so far as this particular species was concerned.

Last summer, however, while trout fishing on the South Branch of the Quyon River, near Thorne Centre in the county of Pontiac, I found a living example—and but one—of this interesting little pearl bearer. It may occur in other places near Ottawa, and is, I am now inclined to think, to be found in the Rideau Canal.

In any case it should be added to our list as occurring in the Quyon. In outward appearance it resembles a small specimen of the common brown clam, *Unio complanatus*.—F. R. L.

#### INTRODUCED MOLLUSCA

It is well known that the eggs of many species of mollusks, as well as the mollusks themselves, are highly resistant to heat and cold, and that some endure desiccation extending over long periods of time. The eggs are frequently deposited among the roots and stems of grasses and plants. Several species have been widely distributed in the straw used for packing articles shipped from Europe to this country. I have no doubt that *Helix cantiana*, which abounds at Quebec in restricted localities near the Citadel and the Observatory, originated in the packing material thrown over the walls of the fortress and on the declivity above the Cove Fields. Two notable importations were brought to my notice some time ago. One was the large European slug, *Limax maximus*, L., which was found by Mr. Scrim in one of his conservatories at Ottawa. The animal had an extent of over four inches, and would in large numbers be very destructive. Fortunately it occurs but rarely and is easily seen. But the other, *Zonites alliarius*, is a much more serious pest. It is minute in size and occurs in considerable numbers. Mr. Scrim finds it chiefly in the greenhouse devoted to the cultivation of palms, ferns and selaginellas. The lace-like traceries wrought on the under surface of a leaf betray the presence of the tiny operator and result in his destruction. When crushed by the horny-handed toilers in the greenhouse, the animal gives forth with its dying breath a strong and surprisingly permanent odor of garlic. Hence the specific name—*alliarius*, L.—F. R. L.

I have received from Mr. G. A. Knight, of Mount Tolmie Nurseries, Victoria, B.C., specimens of this European Mollusk which he has found in some numbers in his greenhouses.—J. F.



## NATURE STUDY—No. XV.

## HOW TO COLLECT AND PRESERVE PLANTS.

By W. T. MACOUN, Horticulturist, Central Experimental Farm, Ottawa, Ont.

While Nature Study does not necessarily involve the accumulation of natural history specimens for the purpose of forming a herbarium, a collection of insects or of bird skins, the making of a collection is undoubtedly of great value both as a means of bringing the student into closer contact and more intimate acquaintance with natural objects, and of inducing a continued and well directed study of them. If one decides to make a collection, it is of the greatest importance that he begin in the right way. It frequently happens that young people, and adults as well, in their enthusiasm, begin collections; but, through ignorance of the best methods of collecting and preserving their specimens, these are improperly made, or, through not knowing the way to preserve them, are soon destroyed by insects, and the collector's enthusiasm is dampened. It is then difficult to get him to start again.

It was felt by the Council of the Ottawa Field Naturalists' Club that very useful work would be accomplished by giving a demonstration of the best methods of collecting and preserving natural history specimens so that anyone who wished to begin a collection might do so in the right way. Accordingly, a special meeting of the Club was held on April 26th, 1904, and demonstrations were given by experts in various branches of science. Mr. A. G. Kingston described his methods of observing and identifying birds with a field glass. Dr. Jas. Fletcher spoke on the advantages of the study of Entomology. Dr. H. M. Ami discussed the collecting and preserving of geological specimens. Demonstrations were given of the mounting of plants by Miss Macoun; of insects, by Mr. A. Gibson and Mr. W. Metcalfe; inflating caterpillars, by Mr. C. H. Young; preparing geological specimens, Mr. Geo. Burland.

In addition to the addresses and demonstrations already referred to, Prof. J. Macoun told how to collect, mount, and preserve botanical specimens, and, in order that as many as possible may get the information thus given by him, the most important

points with regard to collecting and preserving, are made the subject of this Nature Study article, and it is hoped that the other addresses which were given will be published also.

Prof. Macoun said that it was necessary, first of all, to have the desire to make a collection of plants before beginning the work. Unless the student had the desire, little benefit would be derived from it. A good herbarium was a proof that there had been a desire. In collecting plants, it is not very important what they are carried in while out in the field, providing they do not wilt before pressing. The lack of a tin case should not deter one from getting specimens, as a basket answers the purpose very well; but the best practice is to put the plants when collected into the plant press at once. A trowel or a strong knife are convenient for digging up the plants; but these again are not really indispensable, as strong fingers will dig up almost any specimen. A good plant press is a necessity, and it should be light and strong. A very strong press is made with two boards, each made of three pieces of wood nailed together. Each piece is very thin, but great strength is obtained by having the middle piece with the grain crosswise. Joined in this way the boards will stand all the pressure they will get without breaking. When taken to the field, the boards may be kept in place by means of a stout shawl strap, by which also sufficient pressure can be given. If possible, there should be two extra boards at home made of ordinary inch wood, between which the plants may be put the day after they are collected, and pressed by means of a strong strap or some heavy weight. When one is going on a collecting trip, enough papers should be put in the press for all the specimens that are likely to be obtained; but, the lighter the press, the better. Newspapers cut to about the size of the press or a little smaller and of a single thickness of paper are very convenient for putting the plants on, and filter paper or blotting paper for covering the specimen and to absorb the moisture.

When one is making a collection, it is well to try and obtain a typical and perfect plant of the species, as, once an inferior specimen is dried and mounted, one is not likely to get a better one, and perfect specimens add very much to the attractiveness and value of a herbarium. It is sometimes puzzling to the beginner

to know what is a good specimen, as a sheet will apparently only take a plant of a certain size. If the plant is a small one, the whole of it should be taken, the roots being carefully separated from the soil so as to injure them as little as possible. If flowers and fruit can be obtained on the same specimen, so much the better; but usually it is necessary to collect a plant when it is in full flower, and then when the fruit is nearly or quite full grown. In order to get the whole of a large plant on a sheet, it may be bent either once or twice, in order to do it. It is much better to do this than to lose the roots or root leaves, the latter especially being sometimes necessary in identifying specimens. If the stem or root of a plant is thick, it may be cut down its centre, leaving one side intact. Specimens of trees and shrubs may be made of branches a little smaller than the sheet, the important point being to get the whole of the flower cluster, if possible, and one or more well developed leaves. When a plant is laid on the piece of newspaper in the press, the temptation is to spread the leaves out carefully to prevent their creasing. This is a great mistake and many a fine specimen has been spoiled in this way. Some plants will stand such treatment, but many will not. As a rule, the most satisfactory way to do, is to lay the plant on the newspaper, placing the leaves or flowers so that the specimen will look fairly symmetrical and then without trying to take out all the creases in the leaves, put on the filter paper or blotting paper and press the specimen with the hand or between the boards if there is only one plant to put in. The next day, when the plant has wilted, some of the creases can be readily smoothed out; but, after the plant is pressed, these are not noticed nearly as much as when fresh; and, indeed, they sometimes look better, as when the under side of the leaves show here and there, it makes a pleasing contrast, and it is important also at times to show the under side of the leaf as well as the upper side. Some of the more delicate ferns may be dried with advantage between two pieces of newspaper, the drier being put on top of the newspaper. This avoids disturbing the specimen when changing the driers, as the upper piece of newspaper need not be removed until the plant is dry. The specimen when once laid on the newspaper should not be removed from it until it is dry. When a plant is wilted and not dry, it is very difficult and

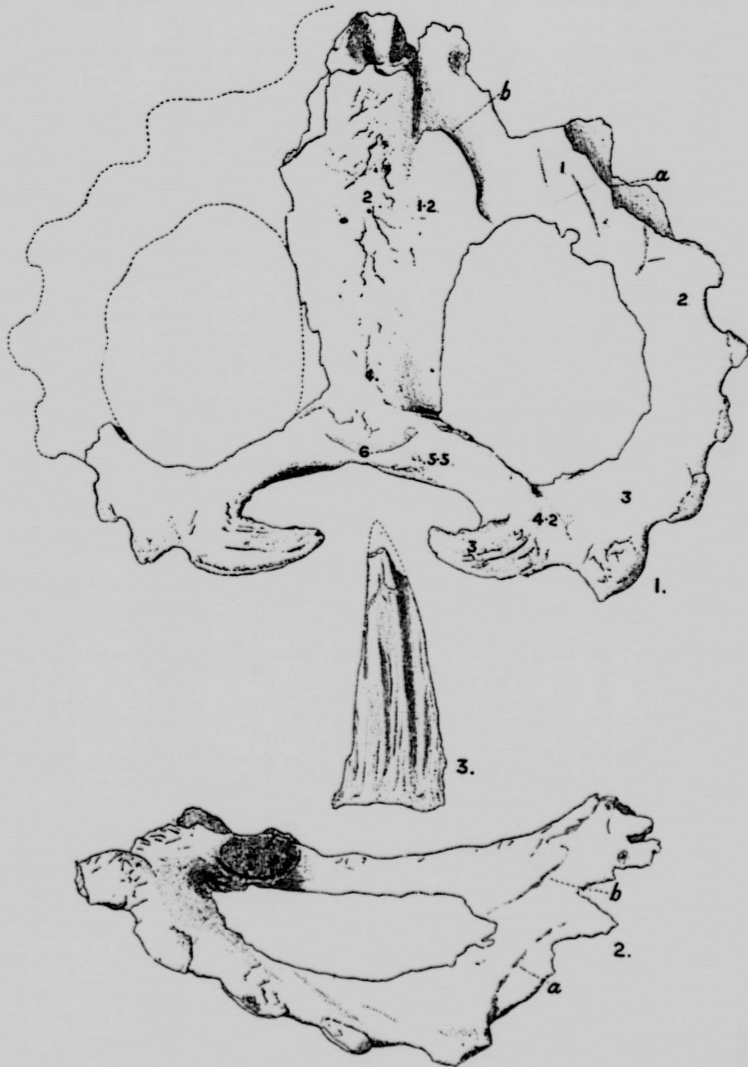
sometimes impossible to replace the specimen without injuring them. An exception may be made with very succulent plants or fleshy plants, when both upper and lower papers should be changed to get rid of the moisture as soon as possible, and sometimes it is necessary to dip the plant in boiling water in order to kill it. Some plants retain their colour fairly well, even if improperly dried, but the majority lose their original colour unless they are dried quickly and properly. Plants should be dried as rapidly as possible after the first day, and in order to do this the driers should be changed at least once a day and, if possible, twice at first. After the first day or two, when the excess of moisture has been removed, the hotter the driers are, the better the results will be, and, in order to have the driers quite hot, they should be heated on or at the stove and put on the specimens at once. If it is not convenient to heat the papers in this way, they may be dried outside and not especially heated. As some plants dry much quicker than others, the best results will be obtained if a thin piece of wood is kept between the plants which are in different stages of drying, as, if this is not done, a plant which would dry very quickly is kept moist by others of a more succulent nature. Some plants will dry in two or three days, and some take nearly two weeks. One can easily tell by the touch when they are dry.

Many a collection of plants has been ruined by insects after it has been made, and the enthusiasm of the collector may die with the loss of his specimens. The poisoning of plants after they have been dried should never be neglected, and the sooner it is done, the better. One of the best formulas for this purpose is : Corrosive Sublimate  $1\frac{1}{2}$  drachms ; carbolic acid,  $1\frac{1}{2}$  drachms ; alcohol, 12 ounces. A small brush is used to apply the poison which should be painted over all the plant that is exposed, the flowers especially getting a full share, as the insects will frequently destroy the flowers when they will not injure another part. Alcohol is used instead of water, as it evaporates without leaving a stain on the paper.

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