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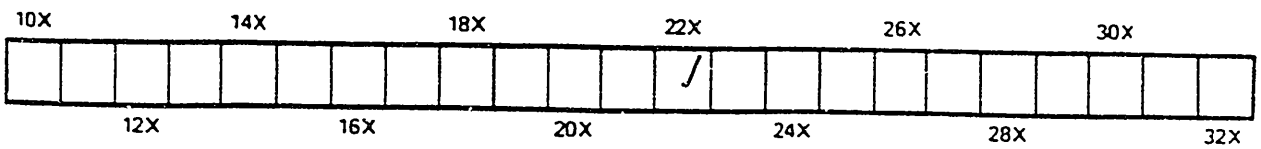

JANUARY, 1901.
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THE OTTAWA NATURALIST.

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CONTENTS.

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THE OTTAWA NATURALIST.

VOL. XIV. OTTAWA, JANUARY, 1901. No. 10.

DESCRIPTION OF A NEW SPECIES OF *UNIO* FROM THE CRETACEOUS ROCKS OF THE NANAIMO COAL FIELD, V. I.

By J. F. WHITEAVES.

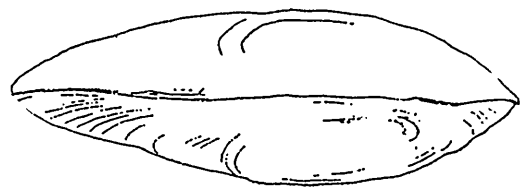
In the second volume of the Palæontology of California, published in 1869, Mr. W. M. Gabb described and figured a Cretaceous species of *Unio*, which he called *U. Hubbardi*. This species was based upon a single specimen, which is said to be "from the Nanaimo Coal Mine, Vancouver Island," and to have been "kindly loaned" to Mr. Gabb by Mr. Samuel Hubbard. It has long seemed to the writer that the evidence for this locality is very unsatisfactory, and that there are two strong reasons for supposing that some mistake has been made in regard to it. The first of these reasons is that no similar specimens have since been found in the Cretaceous rocks at Nanaimo, or any other locality in Vancouver, or any of the immediately adjacent islands, by members of the staff of the Geological Survey of Canada, or by local collectors. The second is that numerous very typical specimens of *U. Hubbardi* were collected at the Cowgitz coal mine, on Graham Island (one of the Queen Charlotte Islands) by Mr. James Richardson in 1872, and by Dr. G. M. Dawson in 1878.

No other land or fresh-water shells have yet been recorded as occurring in the Cretaceous rocks of the Nanaimo, Comox, or Cowitchan coal fields. But in March, 1894, a nearly perfect but somewhat crushed and slightly distorted bivalve shell was found

by Mr. W. Haggart, in shale at the top of No. 6 Pit, Wellington Colliery, Nanaimo. Tbis specimen is now the property of the Provincial Museum at Victoria, B.C., and has been forwarded to the writer by Dr. C. F. Newcombe, of that city, for examination and comparison.

Judging by its external form and surface markings, this fossil seems to be a specimen of a previously undescribed species of *Unio*, that is quite distinct from *U. Hubbardi* and from any of the Unionidæ of the Cretaceous or Laramie rocks of North America. The species may now be provisionally named and characterized as follows :—

UNIO NANAIMOENSIS (SP. NOV.)



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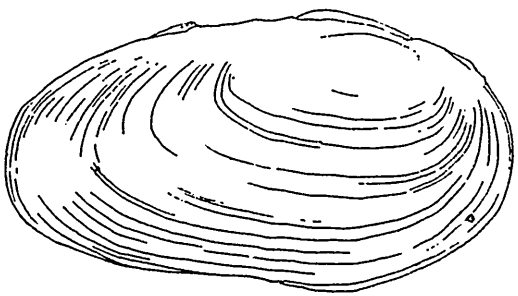

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FIG. 1.— *Unio Nanaimoensis.* Side view of the only specimen known, in outline.

FIG. 1*a*.—Dorsal view of the same, also in outline, to show the proportionate convexity of the closed valves.

Both the figures are of the natural size.

Shell compressed-convex, ovately subelliptical, much longer than high, higher than broad, and very inequilateral. Anterior end short, rounded ; posterior end much longer than the anterior, its extremity obliquely subtruncate above, produced and somewhat narrowly rounded below ; beaks placed in advance of the mid-length ; posterior umbonal slopes not at all angulated.

Surface marked only with numerous concentric lines of growth. Hinge dentition, muscular impressions, and pallial line unknown.

Approximate dimensions of the specimen figured :—Maximum length, sixty-eight millimetres ; greatest height, thirty-seven millimetres ; maximum breadth or thickness, twenty-four millimetres.

The slight distortion and somewhat slickensided movement to which the specimen has been subjected has so displaced the normal position of the valves that the marginal outline is not as distinctly defined as might be desired, and the beaks are no longer quite opposite

As compared with *U. Nanaimoensis*, *U. Hubbardi* is a much more convex shell, with distinctly angular or subangular posterior umbonal slopes, and it is much more attenuate posteriorly.

For the two drawings which are reproduced in this paper, the writer is indebted to his friend and colleague, Mr. L. M. Lambe, F.G.S.

Ottawa, December 4th, 1900.

BOTANY.

Mr. C. Guillet, whose paper "On the Late-flowering of Native Plants," is announced for February 12th, in the Programme of the Club's Winter Soirees, would be glad to receive notes and records of observation on the same subject by other members of the Club.

This notice should have been announced at the last meeting of the Club but was inadvertently omitted.

H. M. A.

A PRELIMINARY NOTE ON AN AMYGDALOIDAL TRAP ROCK IN THE EASTERN TOWNSHIPS OF THE PROVINCE OF QUEBEC.

By JOHN A. DRESSER, Richmond, Que.

A few years ago Mr. J. C. Sutherland called the writer's attention to an apparently peculiar occurrence of feldspar in sedimentary slates in the vicinity of the old St. Francis copper mine, near Richmond, and on subsequent reference to the following description of the occurrence by Sir William Logan (Geology of Canada, 1863, pp. 606-607), suggested a microscopic examination which it has not yet been found possible to carry out. But from several observations made at various times, it is evident that the rock is one of considerable scientific interest and economic importance.

It was thus described by Logan, "Orthoclase . . . . . is found under remarkable conditions among the argillaceous rocks at the St. Francis copper mine in Cleveland. Here beds of a soft, fine-grained, somewhat schistose dark bluish-gray argillite enclose small ovoidal or elongated masses of crystalline feldspar, which have a general parallelism, and are oblique to the divisional planes of the rock. The laminae of this conform to the feldspathic masses which give a knotted surface to the exterior of the rock. These are in some portions from one eighth to one-tenth of an inch in diameter, and are nearly spherical, or elongated two or three diameters. In other portions of the rock they are an inch or more in length, and more irregular, though always rounded in outline. The exterior of the nodules is a white or pinkish feldspar. In some parts the feldspar is seen to extend from the nodules, in thin layers among the laminae of the slate, giving to such portions a gneissoid aspect. In most cases, however, the rock has completely the aspect of an amygdaloid ; especially in sections which exhibit the feldspar surrounding the quartz in the ovoidal masses."

Epidote also forms the cores of some of these masses, while the material of others, though not certainly distinguished from orthoclase by its physical properties, yields much water when heated in the closed tube, and hence is probably a zeolite in part at least. Veins of calcite as well as masses of chlorite, specular

iron, and various ores of copper, especially chalcocite, bornite, and chalcopyrite are of frequent occurrence.

The examination of four thin sections under the microscope suffices to show that the rock is of volcanic origin, and hence is a true amygdaloid instead of an argillite. Although it is much altered, crystals of primary plagioclase can be distinguished in it with certainty. In arrangement they suggest the structure of diabase, but as the interstitial material is wholly secondary, chlorite, iron ore, leucoxene, &c., further evidence is needed to determine its precise original character. This was probably variable, as fibrous hornblende occurs in some quantity at a point about three miles west of the St. Francis river. Also near the same place the rock contains nodular masses three or four inches in diameter, which are composed chiefly of concentric layers of quartz and epidote.

The copper ores, as far as seen, occur in connection with either calcite or quartz, in which cases the latter minerals do not appear to form veins having either uniform width or well defined edges, although they frequently do so in other cases when the veins are much smaller in size. The copper-bearing masses of calcite and quartz, however, seem rather to occupy crevices and fissures, such as might have been produced by the intense dynamic metamorphism by which the entire region has been greatly disturbed, and as the copper, from its position, must have been deposited contemporaneously with these gangue materials, it must like them be regarded as of secondary nature, probably deposited by infiltration.

In its mode of occurrence this rock seems to conform to the stratification of the region, and shares in the foliation which the adjacent rocks have suffered. It lies in the pre-Cambrian, as recently divided by Dr. Ells (Annual Report Geological Survey of Canada, Vol. VII, N. S., Part J, 1894), appearing, wherever it has been observed, between the Cambrian on the northwest and pre-Cambrian strata, generally dolomite or quarzite, on the southeast.

As it has resisted denudation better than most of the associated rocks, it usually forms a rather conspicuous feature of the landscape. The width varies from one to two miles, and the extent along the strike has not been ascertained.

It has been crossed in four different places* viz., about a mile east of the St. Francis River in the township of Cleveland; along the west bank of the St. Francis, and also about three miles further west, in the township of Melbourne; and near Foster Junction on the Canadian Pacific Railway in the county of Brome. The last mentioned locality is about forty miles from the first, yet the stratigraphical relations seem to be the same, it being the most northwesterly member of the pre-Cambrian exposed along the Sutton Mountain anticline.

The economic importance of this rock is due to the copper deposits which are contained in, or are associated with, it. As far as it has been possible to ascertain, all the copper localities of any known importance that are mentioned in the Report of the Geological Survey of Canada for 1866 (pp. 310—314) in connection with the rocks of the Sutton Mountain fold, occur in association with this amygdaloidal trap. Amongst these are the St. Francis, Balrath and Coldspring mines, as well as others which have been more or less minutely described (op. cit. pp. 38-39). From the descriptions of other localities given in the Geology of Canada, 1863, (pp. 606-607) it appears that rocks of this type may have a wide distribution in the Eastern Townships, especially in the copper-bearing districts.

The occurrence of similar rocks also of cupriferous † character in the Appalachians of Pennsylvania**and elsewhere is well known, and the separation of these from the sedimentary strata of the Eastern Townships would be an important step towards a scientific determination of the economic possibilities of this part of the province, as well as towards a more detailed elucidation of its complex geological structure than the progress of scientific investigation in Canada has yet permitted.

* The examination in Melbourne was made with the assistance of Mr. F. W. Major of Bishop's College, Lennoxville, and that at Foster by the aid of Mr. H. A. Honeyman of Knowlton.

**Bulletin U. S. Geol Survey, No. 136, pp. 25—27. "Ancient Volcanic Rocks of South Mountain, Pennsylvania." F. Bascom.

† The line of copper deposits in the State of Vermont, from Berkshire and Richford along the boundary line southward as far as Waterbury, may also indicate the extension of this rock to the south. Vide "Geology of Vermont," 1861, pp. 850 et. seq., by Edward Hitchcock, and "The Report of the State Geologist on the Mineral Resources of Vermont," 1899-1900 pp. 7 & 12, by G. H. Perkins.

THE NESTING OF THE CERULEAN WARBLER.

By W. E. SAUNDERS, London, Ont.

Among the rarer small birds of the Great Lakes region, none have attracted me more than the Cerulean Warbler. Perhaps this has been on account of the difficulties encountered in watching it, and the almost prohibitive heights at which it conducts its matrimonial affairs, or perhaps on account of its dainty colours, pure white beneath and blue above; but from whatever cause, the attraction has certainly existed. Except in the period of nest building, it seldom comes to the ground, and as a rule the song comes from such a height that it takes some minutes to locate the singer. In Ontario, this Warbler is fairly well distributed, and is common from the west end, by the Detroit River, at least as far east as St. Thomas, but as the distance north from Lake Erie grows greater, it becomes less common and more local. Near London it is rare and very local; five males, in widely scattered woods being noted within seven miles of the city this year, while at Bryanston, fifteen miles northeast, there are some woods in which it is fairly common. Its summer distribution on the whole continent is from the Alleghanies west to the plains, and from Tennessee, Kansas, and Missouri north to Central New York, Southern Ontario, Michigan and Minnesota. Throughout this range there are many points of abundance, but its habit of living so high up in the trees makes the finding of its nest so difficult that its eggs are rare in collections, and its intimate acquaintances are few among men; and indeed until I was equipped with a good field glass I accomplished little in the solving of their nesting problem, but this year, encouraged by the experience of Robert Elliott, who found one inaccessible nest in May, 1899, near Bryanston, Ont, I determined to really do some work on this interesting bird.

As its nearest centre of abundance is near the west end of the Ontario peninsula, where I had already met with it in great numbers in a previous year, a preliminary trip was made some miles below Chatham, which resulted in finding two woods where

they were abundant, but there appeared to be no sign of nesting as yet. On June 5th, Mr. Harry Gould went with me for a day with these elusive creatures, and it was well that he did, for in the morning's hunt, which we spent apart from 5 a.m. till ten, he found one nest building, and I none, but in the afternoon, working together, we found five, one of which was building, one with one egg, and the other three with sets of four in each. After failing in the morning we were much disheartened, but during our lunch time, a female was seen working around in the tree-tops beside us, and, watching her while we ate, we were first cheered and then made suspicious, and, as suspicion deepened, we separated, and by dint of the most intent watching, with constant remark from the other person when she was out of the sight of one of us, we at length found the nest with one egg. After that, the operation was more simple, as a single example will show. Hearing a male singing, we approached, and at length spied him preening his feathers and singing between whiles. As this occupation might last for some time, one of us wandered on while the other waited and watched. After perhaps ten minutes, he ceased preening and began to feed. The other hunter was then called in, and establishing himself in a favorable position, both kept our eyes on him, so that when he became invisible to one, the other would inform him of his movements. Soon he made a quick short flight after another bird, and as soon as they alighted we saw it was his mate. Then, with every sense on the alert we left him entirely, and watched her alone, and after feeding for about five minutes she left the feeding tree, flew past me, and right out through an open glade to the nest, 60 yards away in plain sight on the limb of a basswood tree, 50 feet up and 6 feet out from the trunk.

This nest, which is a typical one, is supported almost entirely by its contact with the main limb, which is one inch in diameter. It is built of grasses and bark-strips covered externally with silvery gray bark-strips, in the same manner as the Redstarts, and lined with black horsehairs on the bottom and on one side, the other side being less heavily built and lacking the lining. It measures on the outside 2 inches high and 3 inches wide, and on the inside 15-16ths of an inch deep by 1⅞ inches wide.

These are about average measurements, and this extreme shallowness is only rendered safe by the heavy limbs on which the nests are built, the least diameter of the supporting limb among the eight nests I examined this year being ⅞ inch. The eggs, 4 in number, closely resemble some sets of the Yellow Warbler, but the spots are more brownish.

Near London I found two more nests this year, which were both made by the same birds, but for some unexplained cause the first was never occupied. The second yielded me a set of four eggs, larger, more creamy, and handsomer than those from our western trip, of which I have two sets. All these were taken with the nest attached to the limb as placed by the birds. Of the eight nests found this year four were in basswood, two in maple, and two in oak.

To show how much an acquaintance with the birds affects one's ability to find their nests I may mention that of three species whose nests I never found before, I took three sets of each, viz., the Cerulean Warbler, Yellow-throated Vireo, and Sharpshinned Hawk; in fact, the latter bird rather bewildered the three active oologists of London, who had searched a great deal without finding any nests in previous years, but this year we took between us six sets, comprising 27 eggs, the most distant nest being less than four miles from the city limits.

WINTER SOIREES.

The inaugural meeting of the winter lectures took place on the 11th December in the large Assembly Hall of the Normal School. The proceedings were opened by the delivery of an Address of Welcome by Mr. J. H. Putman, the Science Master of the Normal School. This was followed by the Inaugural Address of the President, Dr. H. M. Ami, F.R.S.C., etc. An interesting feature of the evening was the presentation of a fine portrait of the late Elkanah Billings to the Government of Canada for deposition in the museum of the Geological Survey Department. This portrait was painted by Mr. C. E. Moss, from a painting in the possession of the Natural History Society of Montreal, and was received.

by Dr. Geo. M. Dawson, F.R.S., etc., the Deputy Minister of that Department, with a suitable acknowledgment. Dr. Robert Bell, F.R.S., etc., delivered a lecture on "Various Phases of the Forests of Canada," illustrated with beautiful lantern slides showing typical forms of the more important forest trees of Canada. The president's address, as well as those of Dr. Dawson and Dr. Bell will appear in later numbers of the Ottawa Naturalist. The following is the

ADDRESS OF WELCOME.

By J. H. Putman, B.A., Science Master, Ottawa Normal School.

Mr. President, Ladies and Gentlemen :—

I desire in the first place, on behalf of Principal MacCabe who is unavoidably absent, to extend a cordial welcome to the Field Naturalists' Club and to their friends. I also desire to bear personal testimony to the many kindnesses shown the Ottawa Normal School by the Field Naturalists' Club. The President of the Club and several of its officers have given us much valuable assistance and have shown the deepest interest in our work in science. I am certain that among the happiest memories carried away from Ottawa by our students will be those of pleasant outings with your Club.

May I be permitted for a few moments to touch upon one or two aspects of the work of such an organization as this, as it presents itself to a teacher interested in Nature study. While all of us know that man's intellectual life is a growth from sensation, perhaps we are all prone to underestimate the advantages of having this early sensory training as definite and varied as possible. And yet nothing can be more certain than that, other things being equal, the man who has had his senses well-trained, will have a fuller, richer, happier and healthier intellectual life than the man whose contact with things, and especially with the things of Nature, has been limited. He who has seen but never tasted a strawberry has a poor and very vague idea of that fruit, and he who sees the rose but misses its fragrance, has at most only half the reality.

Oliver Wendell Holmes, in speaking of the little power that some have to observe, says : "Yet there are multitudes

who are present at as many as threescore and ten of Nature's twelve-act performances and never see the scenery, listen to the music or observe the actors." If I understand aright the aims of such a society as the Field Naturalists' Club, they are to help us to hear and interpret the music of Nature's orchestra, the birds, the bees, the winds, the brooks, to aid in our study of the scenery and to encourage us to learn whatever may be known of the actors. It is true there is a utilitarian aspect to Nature study, and this aspect is of great national importance, but, in my opinion, the purely utilitarian aspect need concern us very little. If we, as a nation, can learn to love Nature and to interpret Nature, we shall be certain to make the most of natural resources.

It is really wonderful how much "seeing" is a matter of training, how little may be seen by some and how much can be seen by others; and this training in observation, to be effective, must begin very early in the life of the child. This Society can hope to do very little in gaining the real interest of those who have reached middle life or passed it. This class may be interested for an evening or for a day in some special and very interesting feature of Nature study; they may be amused at any time if the lecturer be interesting, but, unless they have learned to see for themselves and to enjoy the company of Nature, any interest on their part in Nature's wonders is likely to be spasmodic and short-lived. The hope of every society for the encouragement of Nature study lies in the young, and I firmly believe that, were it possible to interest every Canadian child in Nature study, the problem of elementary education would be practically solved. There is something good in every boy or girl. The problem is how to turn the impulses in the right direction. Many children already take a deep interest in the field excursions of this Society, and its officers are to be commended for encouraging them. The inclination towards a study of science has often been received at an early age and sometimes from a beginning apparently trivial. Wm. Hamilton Gibson, the great American exponent of Nature study, whose death a few years ago removed a man of great promise, relates as follows concerning his own beginning: "I was very young and playing in the woods. I tossed over the fallen leaves and came across a chrysalis. There was nothing remarkable in that, for I knew what

it was. But wonderful to relate—providentially I deem it—as I held the object in my hand, a butterfly slowly emerged, then fluttered in my fingers." "You were pleased with its beauty," said a friend. "Oh, it was more than that. I do not know whether I was or was not a child with an imagination, but suddenly the spiritual view of a new or of another life struck me. I saw in this jewel born from an unadorned casket, some inkling of immortality. Yes, that butterfly breaking from its chrysalis in my hand shaped my future." And who can tell how many young people may have received during excursions of this Club an impetus or a spiritual insight into some of Nature's mysteries that has given a permanent bent to the whole life!

One of the saddest sights of these closing days of the 19th century, and particuliarly sad because it seems to be a picture that must grow still darker during the coming century, is the sight of hundreds of thousands of little children growing up in tenement houses, shut away from Nature, denied access to wholesome and pure sights, sounds and odours. "When one thinks of the Greeks," says Ouida, "playing, praying, labouring, lecturing, dreaming, sculpturing, training, living everlastingly in the free wind and under the pure heavens, and then reflects that the chief issue of civilization is to pack human beings like salt herrings in a barrel, with never a sight of leaf or cloud, never a whisper of breeze or bird. Oh, the blessed blind men who talk of progress!"

Fortunately, as yet, our Canadian cities are comparatively free and open and the difficulties of bringing the child into contact with Nature are not great.

I wish for a moment to direct attention to another phase of Nature study and to emphasize another feature of the good work that is done by every society such as this. We pride ourselves upon our 19th century advancement in education and general intelligence. We quote with an air of satisfaction, figures to show that illiteracy is almost unknown among us. This is well, and perhaps there is some justification for our complacency, but I ask you, does the mere ability to read and write necessarily make men and women better? It is true that the mastery of those elements is an essential condition of further progress. But, whether a man is to be a better man because he can read, must in the end depend

on *what* he reads, and, unless we teach *what* as well as *how*, we have made little real progress. Even if we take the most optimistic view, we can get little satisfaction out of statistics bearing on this question. The mass of the people read gossip or thrashy fiction and consider their tastes are above the ordinary if they can appreciate light magazine articles. It is extremely doubtful if the percentage of English-speaking people who really enjoy Chaucer, Shakspere, Milton, Wordsworth or Tennyson, is any greater than it was a quarter or even a half century ago.

What has this to do with Nature study? In my opinion it has everything to do with it. In Fra Lippo Lippi, Browning says, "We're so made that we love them first when we see them painted, things we have passed perhaps a hundred times nor cared to see" Here we have a great truth, and it makes no difference whether the artist has painted with colour or with words. Unless his work means something to us, we cannot interpret it. Every great poet from Homer to Tennyson has been a lover of Nature. Indeed we may almost say that he has been a great poet because he was first a lover of Nature. Every lover of Nature knows something of the poet's thoughts, even though he lacks the power to convey them to others. It is quite impossible, however, to teach either child or man to appreciate the beauties of poetry, unless he has had the necessary training in Nature study, because the subjects of Nature study are the raw material out of which the poet forms his pictures.

Prof. Halleck, of Yale, has, after a careful study, found internal evidence to prove that Shakspere knew the names, notes, habits, eggs and plumage of at least forty birds. Note the following from Shakspere:

> "I know a bank where the wild thyme blows,
> Where oxlips and the nodding violet grows,
> Quite over-canopied with luscious woodbine,
> With sweet musk-roses and with eglantine."

Try if you can to leave out of this picture the wild-thyme, the oxlips, the violet, the woodbine, the roses and the eglantine. Really nothing is left that could convey any intelligible meaning. May we not say then that, not only is a knowledge of nature a joy within itself and an ample reward to a diligent student, but also

that it is absolutely necessary as a touchstone for the interpretation of the highest and best in literature?

LECTURE NIGHT.

The next Evening Meeting of the Club will be held on January 8th, in the lecture room of the Young Men's Christian Association on O'Connor Street, when two most interesting papers, by Prof. John Macoun, and Mr. James McEvoy, both of the Geological Survey Department, will be delivered upon the Crow's Nest Pass. The meeting will be opened punctually at 8 o'clock, and the audience is requested to be in time to take their seats before that hour, so as not to disturb the lecturers and listeners after the meeting has begun. On the same evening the Report of the Botanical Branch will be read, which always elicits a lively discussion. Among other interesting exhibits their will be on view a beautiful collection of paintings of Manitoban plants, by Mr Norman Criddle, of Aweme, Man.—Acting Editor.

PALÆONTOLOGICAL NOTES.

Observations on and Descriptions of Arctic Fossils. By R. P. Whitfield. Extracted from Bulletin of the Amer. Mus. Nat. Hist., Vol. 13, Article 2, pp. 19—22, Plates I and II. New York, April, 6, 1900.

The above is the title of an interesting paper by Prof. Whitfield, the able palæontologist of the Central Park Museum of Natural History. In it he describes a few fossils new to science, and records others of much interest, from collections sent to that Museum by the Peary Arctic Club of New York. Some of these were collected by the expedition of 1898 at "Cape Harrison, on Princess Marie Bay and Summit, Cape d'Urville, in the Arctic Regions," whilst others came from "near the head of Frobisher Bay," and were obtained from Eskimos by G. Cromer, Esq., of Boston, who sent them to Prof. Franz Boas of the Amer. Mus.

of Nat. History. These latter include fourteen species of fossils belonging to the Trenton formation.

The new species described are: 1. *Receptaculites Pearyi*, Whitfield, Cape Bay, Princess Marie Bay, 1898. 2. *Halysites agglomeratiformis*, Whitfield, Cape Harrison, Princess Marie Bay, 1898. 3. *Calapœcia borealis*, Whitfield, Cape Harrison, Princess Marie Bay, 1898. 4. *Heliolites perelegans*, Whitfield, Cape Harrison, Princess Marie Bay, 1898.

Of the above, *R. Pearyi* resembles *R. Oweni*, Hall, from the Trenton (Galena) of Manitoba, and of Illinois, Wisconsin and Iowa; *Halysites agglomeratiformis* resembles *H. agglomeratus* Hall, and *Heliolites perelegans* is related to *H pyriformis*. Prof. Whitfield adds: "These specimens would indicate a geological horizon about the same as that of the New York, Niagara or Clinton group."

H. M. A.

BOOK NOTICE.

THE PALÆOZOIC FAUNAS OF PARA, BRAZIL. 1. *The Silurian Fauna of the Rio Trombetas.* 2. *The Devonian Mollusca of Pará.* By J. M. Clarke, Archivos do Museu Nacional do Rio de Janeiro, Vol. 10, 127 pp., 1899. Author's English edition, 1900.

I. The discovery of these fossils "was one of the results of an expedition made under the direction of the late Prof. Ch. Fred. Hartt while Director of the Commissao Geologica do Brazil," and they now form part of the palæontological collections in the Museu Nacional. Silurian rocks occupy a belt of country bordering the metamorphic region of Guiana, and are about 1,000 feet in thickness. Amongst the interesting fossils described we note:

1. *Arthrophycus Harlani*, Conrad, a very characteristic form in the Medina (Silurian) of Grimsby and St. Catherines, Ontario.

2. *Lingula*, cf. *L. oblata*, Hall, the latter a Clinton species found in Ontario and also in New York State.

3. *Lingulops Derbyi*, Clarke, a form related in many respects to *Lingulops Granti*, Hall & Clarke, from the Niagara of Hamil-

ton, Ontario, and *L. Whitfieldi*, Hall, from the Maquoketa (Ordovician) of Iowa, U.S.A.

4. *Orbiculoidea Hartti*, Clarke, a form probably more nearly related to *O. tenuilamellata*, Hall, than to any other species. *Discina Clara*, Spencer, from Hamilton, Ont., is placed here as a synonym of *Orbiculoidea tenuilamellata*, Hall. Schuchert places *Discina Clara*, Spencer, as a syn. under *Schizotreta tenuilamellata*.

5. *Pholidops Trombetana*, Clarke. This form recalls to mind the *Pholidops implicata*, Sowerby.

6. *Orthis (Dalmanella) Freitana*, Clarke, a form resembling *Orthis (Dalmanella) emacerata*, a variation of *Orthis testudinaria*, Dalman.

7. *Chonetes*, sp. cf. *C. Nova-Scotica*, Hall.

8. *Anoplotheca (Anabaia) Paraia*, Clarke.

9. *Anabaia Anticostiensis*, Clarke. Of this Dr. Clarke writes:

"By a fortunate incident I have discovered a species from the middle Silurian of Cape East, on the Island of Anticosti, which is very similar to *A. Paraia*. It possesses valves of the same contour lacking the reflection of the margins, which may be accidentally absent, as the specimens are preserved in limestone; the peculiar plication of the brachial valves is quite the same, the opposite valve differing only in the presence of a single median plication in the sinus. These specimens have shown a trace of everted oblique internal spires.

The species is without a name, as far as I can ascertain, unless it be that identified by Mr. Billings as *Leptocœlia hemispherica (Atrypa hemispherica*, Sowerby). That it is not the British species, nor that member of the Clinton fauna of New York, passing under the name of *A. hemispherica* (Sowerby) Hall, I am confident. In order to determine whether it was the form referred to by Mr. Billings, I asked Mr. H. M. Ami, of the Geological Survey of Canada to compare it with the types of the Anticosti species in the collections of the Survey, and this he has kindly done, without finding anything that can be regarded as identical or closely similar. I have given a figure of the Anticosti shell on account of its interesting relations to the Brazilian species, and it may be

designated *Anabaia Anticostiana* (see plate I, figs. 26, 27, 28); also more properly called *A. Anticostiensis*, p. 23.

10. *Clidophorus Brazilianus*, Clarke—a form related to *C. planulatus*, Conrad, and to forms from the Silurian of Arisaig.

11. *Bucaniella trilobata*, Conrad, var. *vira. mundo*, Clarke. This is esteemed a variety of *B. trilobata*, a form of which occurs also in the Silurian of Arisaig.

Besides the above there are species of Conularia and Tentaculites, &c., which, taken with preceding and other species described and recorded, form an assemblage bearing affinities to Silurian and Ordovician, and would constitute a Middle Silurian fauna with a different association (as Dr. Clarke states) from the Anticosti Middle Silurian.

II. The Devonian fossils described in Part 2 of this memoir were mainly derived from material collected in the Devonian strata about the little village of Ereré and along the banks of the rivers Mæcurú and Curuá—obtained by Prof. Chas. Fred. Hart when director of the now extinct *Commisao Geologica do Brasil*. Messrs. Hartt and Rathbun had described Devonian fossils from the Ereré-Monte-Alegre District. The Geol. Survey collections of Brachiopoda (24 species) were reported upon by Mr. Rathbun and the trilobites by Dr. Clarke. In this memoir Dr. Clarke describes the Molluscan fossils. It forms an elaborate publication describing and illustrating (as all faunas should be illustrated, from various portions of the continent) all the discovered species of fossils in the Pará Devonian not previously treated. They include seven species of *Platyceras*; three of *Diapharostoma*, one *Pleurotomaria*, two of *Bellerophon*, one *Bucania*, two of *Bucaniella*, two of *Plectonotus*, one *Tropidocyclus*; *Ptomatis*, a new genus of Bellerophontes of type of *B. patulus*, from Corniferous and Hamilton faunas, besides three *Tentaculites*. Of Pelecypoda, two species of *Actinopteria*, one of *Liopteria*, three of *Modiomorpha*, one *Goniophora*, a new sub-genus *(Toechomya)* of Schizodus, of authors, and two species of this new type; two of *Sphenotus*, two of *Cimitaria*, one *Guerangeria* or *Nyassa*, two of *Cypricardella*, six *Granunpiæ*, one *Pholadelia*, one *Edmondia*, two of *Nucula*, four of *Nuculites*, five of *Palæoneilo*, and one *Leda*.

Dr. Clarke then discusses "the inter-relations of the faunas of the Rios Mæcurú and Curuá and the Ereré-Monte-Alegre district; and their degree of equivalence with faunas of other regions." The peculiar association of fossils in the sandstones of the Rio Mæcurú leads the author to state: "There is no similar association of trilobitic species in the North American faunas," yet there are distinct Lower Devonian (Hercynian) traits. There are no Cephalopoda in all the Para Devonian faunas so far as known. A "Lower Devonian" facies is indicated by the Gasteropoda. The Pelecypoda outnumber the Brachiopoda and indicate an eminently Devonian facies in part about Upper Helderberg with "Spiriferen-sandstein" affinities, also inclination towards Middle Devonian or Hamilton. The Brachiopoda indicate Upper Helderberg and Hamilton affinities, many forms having a Hercynian and Lower Devonian aspect.

Then follow discussions on the "Sandstones of Ereré," the "Sandstone of the Rio Curuá," &c., in which the author cites the conclusions of Sir William Dawson on the two Sporangites (*Protosalvinia Braziliensis* and *P. bilobata*), and closes with a table showing the vertical and geographical distribution of the same or allied specific types.

H. M. AMI.

MINING STATISTICS.

The Report of the Ontario Bureau of Mines shows that during the first half of 1900 the yield of gold was $156,269; silver, $51,000; arsenic, $8,980: zinc, $900; iron, $19,532. Two blast furnaces smelted $511,209 worth of ore. The open hearth steel produced was valued at $25,515; nickel, at $413,771; copper ore, $169,986. The total value of metal products for six months was $1,353,287, or two-thirds as much as for the whole of last year. In 1899 Ontario produced forty per cent. of the world's nickel.

BOTANY: An elementary text-book. By L. H. Bailey. 12mo. Half leather. 500 illustrations. Pages XIV—335. The Macmillan Company, N.Y. Price $1.10.

The amount of literature relating to the study of plants which has appeared during the last five years is truly astonishing. For a quarter of a century or more Gray's Lessons with plants was the standard class-room botany. About the time his "New Manual" was published, in 1887, there appeared also other books presenting the study of botany in quite a different manner. Since that time, each year has marked divergences of opinion among botanists regarding teaching methods.

Gray's Lessons did not take up the subject from the present day point of view of botanical science. It is a question with many whether the botanical science standpoint is best for the pupil—the average pupil. There are many text-books for the student of botany. The admirable works of Coulter, Barnes, Atkinson and Canong are written for the college student. There are a few text-books for the pupil. In the present day botany, individuals of the plant kingdom illustrating its lowest and simplest forms are studied first. More complete forms are examined in natural order and regular sequence. This is the logical, scientific method, the one approved by those versed in pedagogy.

Bailey's Botany "is made for the pupil," so its author announces. "There are four general subjects in the book: The nature of the plant itself; the relation of the plant to its surroundings; histological studies; determination of the kinds of plants." The author's position on the teaching of botany in the secondary school has no doubt been much influenced by his intimate association with the Nature study movement in New York, which in itself has been a great training school, is as follows: "In the secondary schools botany should be taught for the purpose of bringing the pupil closer to the things with which he lives, of widening his horizon, of intensifying his hold on life. It should begin with familiar plant forms and phenomena. It should be related to the experiences of the daily life. It should not be taught for the purpose of making the pupil a specialist; that effort should be retained for the few who develop a taste for special knowledge.

It is often said that the high-school pupil should begin the study of botany with the lowest and simplest forms of life. This is wrong. The microscope is not an introduction to Nature. It is said that the physiology of plants can be best understood by beginning with the lower forms. This may be true: but technical plant physiology is not a subject for the beginner. Other subjects are more important. . . . . Good botanical teaching for the young is replete with human interest. It is connected with the common associations. . . . . When beginning to teach about plants, one should think more of the pupil than of botany. The pupil's mind and sympathies are to be expanded; not the science of botany to be extended. The teacher who thinks first of his subject teaches science; he who thinks first of his subject teaches nature study. . . . The old way of teaching botany was to teach the forms and the names of plants. It is now proposed that only function be taught. But one cannot study function intelligently without some knowledge of plant forms and names. He must know the language of the subject. The study of form and function should therefore go together. Correlate what a plant is with what it does. What is this plant? What is its office, or how did it come to be? It were a pity to teach phyllotaxy without teaching light relation· it were an equal pity to teach light relation without teaching phyllotaxy."

Of the book itself there is little need to speak. The subject matter is excellently edited; the illustrations are ela' orately p· fuse—perhaps unnecessarily so—mostly half-tones; the paper and binding are of the best It is an exceedingly attractive volume, and there is not a dull page between its handsome covers.

We shall watch the success of this book, which in a measure is a reversion to former botanical teaching ideals, with a great deal of interest. There is unquestionably a tendency on the part of the advanced teacher of botany to cater to the specialist in scientific botany rather than to the student who wishes to study plants. I think this book has a distinct mission and will find a large constituency awaiting.

J. CRAIG.

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