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THE OTTAWA NATURALIST.

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THE EDUCATIONAL VALUE OF NATURE STUDY.

A. E. ATTWOOD, M.A., Ottawa.

"All things are artificial; for Nature is the art of God."

—*Sir Thomas Browne.*

"New occasions teach new duties;
Time makes ancient good uncouth;
They must upward still and onward
Who would keep abreast of Truth."

—*James Russell Lowell.*

Nature Study is the *natural study*. Children are naturally naturalists. The earliest educational instrumentalities for both the individual and the race are the objects in their natural environment. When a reason is demanded for introducing another subject into an already crowded school programme, a pertinent question to ask would be: Why stop Nature Study when the child enters our schools? The onus of proof rests on those who would cease teaching nature when school-life begins. The Kindergarten is intended as a continuation of the natural method into school life, and is now an established feature of our educational system. Again, we might ask, Why stop Nature Study when the child leaves the Kindergarten?

In our High Schools natural science has passed the experimental stage, and now no serious student can claim to have a liberal education who is ignorant of the great principles revealed by scientific research. The most important part of a student's course, that of the Public School, does not yet officially recognize the educational value of first-hand knowledge. Should we not

assume that a subject suitable for very young children and for mature students is an appropriate one for the intermediate age?

Herbert Spencer defines Life as "the power of continuous adjustment of internal relations to external relations." Just as physical life depends upon continuous adjustment to environmental variations, so does the life of a system of education depend upon its constant adaptation to the Spirit of the Times Let us briefly consider the chief characteristics of the Twentieth Century educational *Zeit Geist* which has been called "The New Education." We shall then inquire whether Nature Study is a subject in harmony with the ideals of the New Education.

The following are four of the chief requirements of the New Education.

I. With special reference to the student :

a. Study things rather than books, the actual rather than the representative, first hand rather than second-hand knowledge.

b. Study causes rather than effects, general principles rather than mere facts, the *why* rather than the *what*.

II. With special reference to the teacher :

c. Attract rather than compel the learner, remembering that the most favorable results are obtained when the child is in sympathy with the teacher and the subject.

d. Develop the child rather than teach the book, remembering that education is now *pædocentric* and no longer *bibliocentric*.

a. Things rather than books.

"Education is the cultivation of a just and legitimate familiarity betwixt the mind and things." The introduction of manual training is evidence that we are recognizing the fact that in the education of the young, *things* should be used as instruments of training. In Nature Study, the physical, the tangible, is employed with the object of leading the pupils to discover truth there objectified. "The world is the thought of God." True Nature Study is an effort of interpretation, of trying "to think God's thoughts after Him." It is teaching through things instead of through signs of things.

"Things rather than books," must not be construed, things and not books. In nature, the development of the individual epitomizes the development of the race. The individual does not pass through *all* the stages through which the race has passed but short cuts are employed when advantageous. Here we have a hint as to the true function of books in education. The work of the young student should epitomize the work of investigators in general but it would be a ruinous waste of time and energy to perform all their researches. The spirit of Nature Study can be cultivated by first-hand investigation of a few facts. Such experience will enable the student to interpret and appreciate what can be more economically obtained from books. Books should be used to direct research, to obtain otherwise inaccessible information, to economize effort by utilizing the labors of others, and to correct or corroborate conclusions deduced from personal experience. A wise man learns through the experience of others. The student should do sufficient original work to enable him to interpret and in a measure appreciate, the results of the greater work performed by greater students. Books are the equivalents of Nature's short cuts.

b. Causes rather than effects.

The causal idea in education is slowly coming into prominence. Geography, for example, is being taught as *earth-study*, not as a study of a description of the earth. Formerly we studied merely the present form of the earth; now an effort is made to ascertain the relationship between the life history of the earth and its present form. Physical facts have significance and it is the business of the student to interpret a given condition and not to rest satisfied with the mere knowledge that such a condition exists. "Mere facts are dead, but the meaning of the facts is life. The getting of information is but the beginning of education... Not the fact, but the significance of the fact." In Nature Study children are encouraged to investigate the cause of a given occurrence. Varying conditions are introduced to modify natural causes and varying results are the consequence. The method of Nature Study is the method of practical life where events do not always happen logically and where varying circumstances must be constantly considered.

c. Attraction rather than compulsion of learner.

A child with a healthy appetite craves wholesome food. The appetite is a guide in the determination of the kind of nourishment required, because foods desired and relished are generally needed by the child. Curiosity and interest are the psychological equivalents of appetite and relish and they likewise indicate the subjects that promote mental development. The time of interest is the time of opportunity.

That children are attracted by the "natural subject" needs no proof. Nature Study requires direction and encouragement, but never compulsion, as it contains its own propelling power. It is interesting because of its unceasing novelty, because it affords a means for the exercise of the self activities of the student, and because of the sympathy generated by intimacy with living things.

"And whenever the way seemed long
Or his heart began to fail,
She would sing a more wonderful song
Or tell a more marvellous tale."

d. The child rather than the book.

Previous to the time of Copernicus it was believed that the universe was geocentric; the Copernican theory teaches us that our system is heliocentric. As great a change will take place in our methods of teaching when we practically realize that it is the child rather than the book that is to be considered; that our educational system is no longer bibliocentric, but pædocentric. In the past we have prepared the subject that we wished to teach; in future, the child also must be prepared to receive the instruction. A person whose duty it is to attend to the purely physical welfare of a child does not say: Here is a certain amount of food to be eaten; how can I so prepare it that it can be devoured in the shortest possible time and with the least possible effort? She rather says: Here is a child to be nourished. Whence can I obtain food that will best promote healthy development?

Now what is the connection between this characteristic of the New Education and Nature Study? Study the child rather than the subject. Child study should precede subject study. The child being a natural product is an integral part of nature. Thus,

child study is a department of Nature Study. If life is the adjustment to environment, it is evident that the life and the development of the child are promoted by causing it to be in harmonious relationship with its environment, in other words, by directing it in Nature Study.

The aim of Nature Study is to unite the inner intellectual world of the child with its outer physical world, for only through this unity can the highest good be attained. The effort which the young student of nature makes to relate, to group, to unify, is the same in kind, differing only in degree, as that of the highest scientific and philosophical research. "The better the child realizes that school is out-of-doors as well as in the schoolroom, in plant and animal and stone, in cloud and sunset and waterfall, as well as in book, the more complete will be the unity between his physical and intellectual world. The more his nature study is correlated with, and made a basis for, his language work, drawing, reading and literature, the more will the unifying tendency of the mind be satisfied."

In the foregoing paragraph an effort has been made to show that Nature Study is in harmony with the ideals of the New Education (1) in its efforts to lead to the acquisition of first-hand knowledge by an intimacy with things, (2) in its emphasis of the causal as contrasted with the fact idea, (3) in its endeavor to present a subject congenial to the learner, and (4) in its regarding the child as the all-important fact in education.

Before proceeding further it may be well to give in the form of definitions the conception which some educationists have of this subject.

L. H. Bailey calls it "nature sympathy." It is "teaching the youth to see and to know the nearest thing at hand to the end that his life may be fuller and richer" Clifton F. Hodge defines it as, "Learning those things in nature that are best worth knowing, to the end of doing those things that make life most worth living." It is "a new element in education which has for its object the cultivation of the child's intelligent interest in his out-of-door environment," writes Anna B. Comstock. Longfellow

speaks of "the manuscripts of God" as "a storybook thy Father has written for thee,"

> "'T is elder Scripture, writ by God's own hand;
> Scripture authentic! uncorrupt by man."

"Nature is the incarnation of a thought and turns to thought again as ice becomes water and gas. The world is mind precipitated and the volatile essence is forever escaping again into the state of free thought. Hence the virtue and pungency of the influence on the mind of natural objects, whether inorganic or organized. Man imprisoned, man crystallized, man vegetative, speaks to man impersonated."—*Emerson.*

In harmony with Emerson's conception, Nature Study may be defined as: Active, earnest, and reverent attention to our physical environment with the object of endeavoring to interpret the thoughts there objectified thereby bringing ourselves into unity with the Source of All.

It may be contended that the foregoing is too transcendental a definition for a subject that deals with what is material. But is the ideal too high? The greatest thought of the nineteenth century is nothing more than a philosophical principle based on careful Nature Study: the theory of Evolution is a sublime interpretation of observed facts of nature.

Educationists have grouped the various subjects in a perfect course of study into four classes, the aims of which are respectively:

a. The acquisition of Knowledge.
b. The development of Skill.
c. The acquirement of Discipline.
d. The attainment of Culture.

If a subject is instrumental in furthering any one of these aims it has a claim to be represented on an educational curriculum. If, however, it secures all four it should unquestionably be employed as an instrument of education. Let us briefly consider the efficiency of Nature Study from these standpoints.

a. The first in time, but from an educationist standpoints, the last in importance are the Guidance studies, the particular purpose of which is to furnish the mind with facts, information,

Knowledge. The acquisition of knowledge satisfies our curiosity or mental appetite, the mind is nourished, and intellectual growth becomes possible. As a subject taught purely as fact-lore, science ranks as high as any other. The fund of information which a scientist possesses is of itself a source of great pleasure and profit to the owner. A few years ago a person was not regarded as educated who could not interpret the writings of the ancient Greeks and Romans; a few years hence a person will not be regarded as educated who cannot interpret the "manuscripts of God," the open book of Nature. Important as scientific knowledge is, its acquisition by the sudent of nature is merely incidental, it is a by-product, a side-issue. We do not advocate a course in Nature Study for the purpose of merely storing the mind with useful information.

b. From an educationist's standpoint, Skill or executive power is an instrument for higher acquisitions. A large amount of mechanical skill is developed in raising and training plants and animals, in mounting botanical and entomological specimens, and in manipulating apparatus employed in various experiments. Moreover, Nature Study forms an excellent basis for much expressive school work which is largely a matter of skill: the oral and written expression of facts observed and truths ascertained, the drawing of the natural objects considered, and the general impulse to tell what is seen, develop power in all forms of expression.

Though the constant manipulation of natural objects will develop a high degree of practical efficiency, we do not advocate that Nature Study should be taught merely with the object of acquiring Skill. Why should we content ourselves with a high ideal when there is a higher?

"We needs must love the highest when we see it."

c. The subjects of Discipline or training are those whose aim is to develop mental power, that is, power to think logically, to reason consecutively, to generalize broadly. While scholarship, capacity, is the aim of knowledge subjects, potentiality, capability, is the aim of educational discipline. The mind is treated, not as a tank to be filled, but as an organism to be quickened or as a faculty to be developed.

Nature Study is the Public School equivalent of the natural science of secondary schools. In Baldwin's "Applied Psychology" science is placed highest, in his estimate of the relative value of different studies. The method of science is to ascertain unknown truths by experimental observation. The end of scientific investigation is to arrive at great fundamental principles. Though the genius does not necessarily observe the following progressive steps, they may be regarded as indicating the scientific method.

1. Observation of phenomena and accumulation of facts.
2. Classification of facts.
3. Induction or inference based on observed facts.
4. Deduction from inference. Is the hypothesis workable?
5. Modification, correction, or verification of hypothesis.
6. Enunciation of a theory.
7. Application of theory in subsequent investigations.
8. Unification of the theory with some Law of Nature.

"When Nature becomes the subject of study, the love of Nature its stimulus, and the order of Nature its guide, then will results in education rival the achievements of Science in the fields of its noblest triumphs." Some of the benefits to be derived are:

Independence.—The constant exercise of the power of individual investigation is the best possible preparation for practical life where success depends largely upon personal effort. School should be an integral, harmonious and indispensable part of life.

Liberality.—The habitual hesitancy to generalize on what may be insufficient data, and the consciousness of one's liability to err, tends to develop liberality in dealing with the opinions of others.

Truth.—Reality is attained not so much by learning the the dogma of another, but by continued personal investigation. Truth is not the peculiar property of the teacher, but is revealed to him who diligently seeks it. The truth seeker does not combat recently ascertained knowledge but accepts it gladly.

Unity.—The continued effort to discover unity amid apparent diversity results in mental exhilaration and intellectual satisfaction and security. One realizes that the universe is not governed by caprice, but by

"That God, which ever lives and loves,
One God, one law, one element,
And one far-off divine event,
To which the whole creation moves."

4. Culture is the expanding, the mellowing, and the purifying of the soul by constant contact with the true, the beautiful and the good.

"To him who in the love of nature, holds
Communion with her visible forms, she speaks
A various language; for his gayer hours
She has a voice of gladness, and a smile
And eloquence of beauty, and she glides
Into his darker musings, with a mild
And healing sympathy, that steals away
Their sharpness, ere he is aware."

"Culture is the slowly maturing fruit of a silent feeding of the soul upon nourishing ideas. While discipline looks to the volume of mental power, culture looks to its kind. Culture is the tone of power, rather than its amount or intensity. It is a qualitative rather than a quantative word"—*Hinsdale*.

"Culture is the study of perfection." It is the endeavor to *see* and *learn* the will of God and make it *prevail*. "It is in making endless additions to itself, in the endless expansion of its powers, in endless growth in wisdom and beauty, that the spirit of the human race finds its ideal. To reach this ideal culture is an indispensable aid, and that is the true value of culture." "Not a having and a resting, but a growing and a becoming, is the character of perfection as culture conceives it."

Nature is a slowly-evolving, ever-attaining but never-ending process by which the divine ideal is being realized. It is a panoramic unfolding of God's way of doing things. It is "not a having and a resting but a growing and a becoming."

"Every clod feels a stir of might,
An instinct within it that reaches and towers,
And, groping blindly above it for light,
Climbs to a soul in grass and flowers."

A characteristic of both Nature and Culture is the unceasing striving onward and upward. Nature is universal and physical. Culture is individual and spiritual. A harmonious alliance results

when the individual Culture is united with universal Nature: "My Father worketh hitherto and I work." Our minds are enlarged in the ratio in which our conception of our environment is enlarged. What we get from Nature depends upon our attitude towards her. The character of our interpretations will be in proportion to our power of interpretation. The amount we take from Nature cannot exceed the amount we take to her.

"Is Nature all so beautiful?
The human feeling makes it so.
The sounds we love, the flowers we cull
Are hallowed with man's joy or woe."

A child who has been trained to care for plants and animals will develop a generous sympathy for all living things. Harmony and good-fellowship will characterize his intercourse with his playmates while he is young and with his fellow-citizens when he becomes older. A student of Nature becomes one of Nature's gentlemen.

"The slowly maturing fruit of a silent feeding of the soul upon nourishing ideas" will be evidenced in the character of him who has an intelligent appreciation of the true, the beautiful, and the good in Nature. Who better than he can feel sentiments such as that expressed by Adelaide Proctor?

"My God, I thank Thee, who hast made
The earth so bright,—
So full of splendor and of joy,
Beauty and light,—
So many glorious things are here
Noble and right."

NOTES ON THE SIZE OF HAWKS' EGGS.

By J. E. KEAYS.

(Read before the Ornithological Section of the Entomological Society of Ontario.)

A measurement and comparison of the cubic contents of the eggs of the red-shouldered and red-tailed hawks, with the addition of the measurements of a small series of broad-winged and Swainson's hawk. In making the following measurements, I am indebted to Mr. W. E. Saunders for the use of his collection and for notes on the same.

In all, eighty-five eggs of red-shouldered, seventeen of red-tailed, three of broad-winged, and six of Swainson's hawk, have been measured, and although no large sets of red-tailed were available, the measurements go to show, that presuming that every two sets of red-tailed hawk contained five eggs unitedly (which in this locality is far above the average), still the average set of red-shouldered would exceed that of the red-tailed by nearly 15 cc., and six of the twenty-five sets of red-shouldered measured, are greater than an average set of three red-tailed, while two others are almost equal.

Of the eighty-five red-shouldered eggs, only one exceeds the average red-tailed in size, although four others are within a small fraction of a cc. of being equal to it.

An article published in "The Ornithologist and Oologist," 1886, page 118, entitled: "The Relative Size of Eggs of the Red-tailed Hawk to the Parent Bird," proves with but little doubt, that the larger the female of a species, the larger the egg deposited by her. Accepting this as a fact, it would now be of interest to compare the female birds of this species, not by measurement but by weight, for although the red-tailed hawk is apparently a much larger bird, its feathers are longer and looser, and there is a doubt in my mind whether it weighs as much more as it appears to.

It would also be of interest to compare the relative weights of both these birds with the cubic contents of sets deposited by

them, and I hope to see other investigations in this line. The table below giving the measurement of each egg in cubic centimeters, with total contents of set, average, etc., is followed by notes on several of the sets by Mr. Saunders, showing the relative sizes of eggs deposited from year to year by the same bird.

RED-SHOULDERED HAWK.

Set No.	No. 1.	No. 2.	No. 3.	No. 4.	Total contents of Set.	Average contents of each Egg.	
3349	52	51	53	.	156	52	1885
4040	58	57	58	..	173	57 2/3	1898
4165	52	57	57	..	166	55 1/3	1899
3777	51	52	50	53	206	51 1/2	1901
3882	50	52	55	..	157	52 1/3	1902
3784	46	46	45	..	137	45 2/3	1901
3883	49	45	46	..	140	46 2/3	1902
4061	56	59	57	.	172	57 1/3	1898
4224	63	63	67	60	253	63 1/4	1900
3780	60	63	63	59	245	61 1/4	1901
3887	40	43	43	40	166	41 1/2	
4225	48	51	51	..	150	50	1900
3782	46	46	46	..	138	46	1901
3888	56	60	55	..	171	57	
3886	60	58	60	59	237	59 1/4	
3884	48	46	45	49	188	47	
3891	48	46	46	..	140	46 2/3	
3889	50	50	46	..	146	48 2/3	
3548	54	55	53	50	212	53	
4222	48	48	49	..	145	48 1/3	
222	47	44	44	..	135	45	
221	45	50	52	48	195	48 3/4	
293	48	46	50	44	188	47	
291	45	43	45	..	133	44 1/3	
220	45	43	44	42	174	43 1/2	

Largest egg, 67 cc. ; smallest, 40 cc.

Largest set, 253 cc. ; smallest, 133 cc.

Largest egg to set, 63 1/4 cc. ; smallest average egg to set, 41 1/2 cc.

Average of 85 eggs measured $50\frac{73}{85}$ cc.

Average contents per set, $172\frac{233}{255}$ cc.

Leaving out the three sets, 4061, 4224, 3780, supposed to be from same bird, the average is 49 3/7 cc. per egg, and 166 1/2 per set.

RED-TAILED HAWK.

Set No.	No. 1.	No. 2.	No. 3.	Total contents of Set.	Average contents of each Egg.
223	66	67	..	133	66½
292	62	57	..	119	59½
306	62	..	..	62	62
361	61	66	.	127	63½
4227	68	69	..	137	68½
3864	59	61	..	120	60
4226	69	69	..	138	69
4058	61	60	..	121	60½
4220	60	57	..	117	58½

Largest egg, 69 cc. ; smallest, 57 cc.

Largest set, 138 cc. ; smallest, 117 cc. of two eggs, 62 cc. of one egg.

Largest average egg to set, 69 cc. ; smallest, 58½.

Average of 17 eggs measured, 93 3/7.

BROAD-WINGED HAWK.

3621	41	..	..	..	41
4020	35	37	..	72	36

SWAINSON'S HAWK.

218	54	57	57	168	56
300	56	50	50	156	53

In this list of eggs there are 4 series of eggs, taken from the same woods in different years, all being first sets only, the birds having been allowed to raise their second set in each case.

No. 3784, 4 miles from London, were taken in 1901, and average 45 2/3 cc. In 1902, from a new nest, about 50 yards from that of 1901, the set 3883 was taken which average 46 2/3 cc.

Both markings and size accord well, and the two sets were doubtless laid by the same bird.

Sets 4061 and 4224, measuring respectively 57⅓ and 63¼ cc. were taken in 1898 and 1900 from a nest near Mount Brydges. Their extraordinary size, as well as the markings, and the fact that they were in the same nest, testify to their being the product of the same hen. In 1901 she not only moved from the old nest, but removed every vestige of it from the tree. That nest had existed for at least twelve years, and was occupied by a red-shouldered hawk each year that the locality was visited. She built a new nest about one quarter mile east of the old one in the same woods, and laid set No. 3780, averaging 61¼ cc., which in size and colors agree with the former ones. This hen must have been of extraordinary size to lay such large eggs, and as the female hawk is usually larger than the male, it is probable that this one was much larger than her mate, and she may have been entirely too authoritative in her manner to suit him ; at any rate, when she vanished from the scene (between the springs of 1901 and 1902), he proceeded to get for himself a mate as near the other extreme as possible, and the new occupant laid in 1902, the 4 eggs No. 3887, which measure from 40 cc. to 43 cc., and average 4 1/2 cc., being the smallest average by 2 cc. of any set of red-shoulders to which I have had access. These eggs were laid near the original site, in an oak tree, and it is interesting to note that the original site in a gnarly beach, is occupied this year by a crow, and may probably be again used by a bird of prey in the near future.

Set No 4225, in 1900, averaging 50 cc., and No. 3782, in 1901, averaging 46 cc., were taken in Komoka swamp from trees about 50 yards apart and size and shape as well as locality proclaim them to be from the same bird. She, too, has evidently perished, as in 1902 the pair here used a nest in a pine tree near-by, probably the same one that was used by them in 1901 for their second set, which was placed in just such a position, and the set of eggs No. 3888, averaging 57 cc., are in every respect different from those of the previous years.

The last series to be considered begins with set No. 3349, averaging 52 cc., and laid in 1885. From the same corner of the same woods was taken set No. 4040, in 1898, and while their colour is very similar to the set of 1885, the measurements, aver-

aging 57⅔ cc., point to the probability of a new female, and indeed it is not likely that any red-shouldered hawk lives as long as 13 years in a country so thoroughly hunted as that about London. In 1899, this pair provided a surprise, for, from the same nest in the same beech tree was taken set No. 4165 which, while averaging 55⅓ cc., only 2⅓ cc. different from those of 1898, differ remarkably in shape, being long like a hen's egg; yet the colors approximate closely to those of the 1899 eggs, and they were probably laid by the same hen. In 1900 a sugar camp was located beneath this tree and the nest of these hawks was not found. In 1901, however, a pair was on the scene once more with a nest in a maple less than 100 yards from the old nest, and this time set No. 3777 was taken, consisting of 4 normally shaped eggs averaging 51½ cc. and resemhling less closely those of the former years. In 1902, from another maple near the last, was taken set No 3882, averaging 52⅓ cc., which bear no resemblance to those of former years either in color or shape.

CONCHOLOGY.

NIAGARA RIVER SHELLS.

Dr. James Fletcher was recently at Niagara Falls, and taking advantage of the conditions resulting from the construction of a wing-dam above the Dufferin Islands, by which a large portion of the river bed above the falls has been laid bare, he collected quite an interesting series of shells.

The following species have been noted:

Linnæa catascopium, Say.
Goniobasis livescens, Menke.
Pleurocera subulare, Lea.
Unio luteolus, Lamarck.
U. ellipsis, Lea.
U. gibbosus, Barnes.
Margaritana marginata, Say.
Sphærium striatinum, Lamarck.

The specimens of *U. luteolus* are not of so decided a green in color as those found in the Rideau Canal and River near Ottawa, and are much more inflated.

The *U. gibbosus* are small and differ materially in form from the shell as usually found in the Ottawa River, where it occurs sparingly at the outlet of Brigham's Creek and at the lower end of Duck Island. They are, however, identical with a single specimen found many years ago in the "chenal" at the Little Chaudiere. This peculiar little shell is the only specimen of *U. gibbosus* known to have been collected in the Ottawa River above the Chaudiere Falls.

With the shells obtained by Dr. Fletcher was a specimen of the remarkable spiral caddis-case, which the late Isaac Lea,--in his time the most prolific writer on Conchology,—regarded as a true mollusk, and named *Valvata arenifera*. Dr. Fletcher, of course, as an experienced entomologist, placed the so-called shell in its proper place.

L.

A NATURAL HISTORY MUSEUM, AT BETSIAMIS, QUEBEC, CANADA.

The Reverend Père C. A. Arnaud, of Betsiamis, has established and encouraged the development of a Natural History collection at this trading post.

In the year 1868, Alfred Lechevalier, a French Naturalist, visited the post and spent that year and the following winter in mounting the specimens of the fur-bearing animals which he had obtained in that region, and of birds which he had shot the season previous, in different portions of the Great North-East.

Birds, mammals, reptiles, etc., make up the materials of the Natural History portion of the collection of that Museum, whilst various other kinds of specimens have been added and obtained chiefly from the aborigines who come to the post from time to time. The value of the collection is estimated by Abbé Huard at $4,000.00.

Grosjean, another naturalist, from old France, came later and added many specimens, chiefly birds, and displayed much skill as a taxidermist.

For the above statements, I am indebted to Abbé V. A. Huard, the enthusiastic editor of "Le Naturaliste Canadien," who records them in his interesting book of travels entitled "Labrador and Anticosti," published in 1897, in Montreal, by C. O. Beauchemin & Fils, and in Paris, by A. Roger & F. Chernoviz.

H. M. A.

RUSKIN'S DEFINITION OF THE WORD MUSEUM.

"A museum," 'is, be it first observed, primarily not at all a place of entertainment, but a place of education, and a museum is, be it secondly observed, not a place for elementary education, but for that of already far advanced scholars, and it is by no means the same thing as a parish school, or a Sunday school, or a day school, or even—the Brighton Aquarium.'

"Be it observed, in the third place," "that the word 'School' means 'Leisure,' and the word 'Museum' means 'Belonging to the Muses;' and that all schools and museums whatsoever can only be what they claim to be, and ought to be—places of noble instruction, where the persons who have a mind to use them can obtain so much relief from the work, or exert so much abstinence from the disipation of the outside world as may enable them to devote a certain portion of secluded, laborious, and reverent life to the attainment of Wisdom."—Fors Clavigera, vol. v.

CORRESPONDENCE.

ON THE UPPER CRETACEOUS AGE OF THE BELLY RIVER SERIES OR FORMATION IN CANADA.

Editor, OTTAWA NATURALIST:—

The recent work "On the Vertebrata of the Mid-Cretaceous of the North West Territory," by Henry Fairfield Osborn and Lawrence M. Lambe, as well as the "Review" of the same by

W. D. Matthew[1] call for a few comments as regards the geological position of the Belly River series or formation.

In defining the series, Dr. G. M. Dawson,[2] and R. McConnell write: "Briefly stated, it would appear from investigations now reported on that considerable area of the beds, which in 1874 I called 'Lignite Tertiary,'—here and in previous announcements designated as Belly River series—must be relegated to a position below the Pierre shales," and further adds: "The beds thus separated as the Belly River series were, in 1875, by me correlated with the Judith River series of the Missouri."

Later, in 1886, R. G. McConnell[3] gave the succession of the "Cretaceous formation' inhis "Report on the Cypress Hills, Wood Mountain and adjacent country," in descending order as follows:

Cretaceous { Laramie. / Fox Hill. / Pierre. / Belly River series.

and in p. 65C, he unites the Pierre and Fox Hill deposits together under the same head, and lists the marine invertebrate fauna determined by Dr. Whiteaves pp. 66C & 67C.).

In 1887, J. B. Tyrrell[4] gives the following succession in descending order:

Laramie—
- Paskapoo series.
- Edmonton series.

Fox Hill and Pierre.

Belly River series.

Of these, Tyrrell placed the "Paskapoo" beds in the Eocene Tertiary and the remainder below (as cited) in the Cretaceous.

In his "Cretaceous System in Canada," Dr. Whiteaves gives the following succession of the Cretaceous of Manitoba and the North West Territories:

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[1] Ottawa Nat., vol. XVI, No. 8, p. 169. Nov., Ottawa, 1902.

[2] Geol. & Nat. Hist. Surv. Can., Rep. of Progress, 1882-85-84, p. 119C. Montreal, Can.

[3] Geol. & Nat. Hist. Surv. Can., Ann. Rep., vol. I, page 63C. Montreal, 1886.

[4] Geol. & Nat. Hist. Surv. Can., Ann. Rep., n. s., vol. II, p. 127E. Montreal, 1887.

V. Laramie.
IV. Pierre-Fox Hills.
III. Belly River series.
II. Niobrara-Benton.
I. Dakota.

There is now no reason to doubt the position of the Belly River series in the succession of sediments in the region of the Great Plains; nor its position above the Niobrara-Benton, which in turn is underlaid by the Dakota formation, which latter is recognized by all to be of Upper Cretaceous age. The only conclusion, therefore, that one can reach is that the Belly River series is high up in the Upper Cretaceous. This is the place where it has stood for years, and the large percentage of Tertiary invertebrates, found within its upper and lower limits, which have a close affinity and remarkable resemblance to Eocene Tertiary forms (many forms being identical) must lead one to conclude that it cannot be in the interest of chronological geology to place the Belly River series in the Middle Cretaceous as we would be led to believe from the recent writings above referred to. It may well be that many forms of the vertebrata occurring in the Belly River series are primitive in their character, *i.e.*, show traits which are older than are exhibited by their successors or descendants in later times; nevertheless, when the age of a geological horizon or series of strata has to be determined, the whole biologic assemblage must be taken into consideration. When such is taken, it is impossible to arrive at any other conclusion either on stratigraphical or palæontological grounds than that the Belly River series is not Middle Cretaceous but UPPER CRETACEOUS, and well up in that portion of the Time-scale. As to its occurrence as an intercalated or "mid-Cretaceous" formation I have no doubt. However, the term "Mid-Cretaceous" appears to be an ambiguous one and may lead to further confusion.

To anyone who has considered the flora and fauna of the Belly River series as a whole, as well as the flora of the Dakota, and compared them with European equivalents it is easy to see their Senonian or Upper Cretaceous age clearly.

H. M. A.

PROGRAMME OF WINTER SOIRÉES, 1902-1903.

1902.

In the Assembly Hall of the Normal School. Dec. 16.—President's Address: "The Functions of a Geological Survey," by Robt. Bell, M.D., LL.D., Sc.D. (Cantab.), F.R.S.

Address of Welcome, by the Principal of the Normal School.

"*Some Ottawa Butterflies and Moths*," by Dr. James Fletcher, illustrated by coloured lantern slides.

Conversazione, with exhibition of Natural History objects and microscopic slides.

1903.

In St. John's Hall. Jan. 13.—"*The Scenery of the Rocky Mountain Region*," illustrated by lantern slides, by Dr. R. A. Daly, of the Geological Survey.

Report of the Geological Branch.

In the Assembly Hall of the Normal School. Jan. 27.—"*The Wood-pulp Industry of Canada*," by Professor D. P. Penhallow, McGill College, Montreal, illustrated by lantern slides.

In the Assembly Hall of the Normal School. Feb. 10.—"*Nature Study in American Universities*," by Dr. S. B. Sinclair, of the Normal School, Ottawa.

Report of the Entomological Branch.

In St. John's Hall. Feb. 24.—"*The Summer Climate of the Yukon and its Effects on Vegetation*," by Professor John Macoun, of the Geological Survey.

Report of the Botanical Branch.

In St. John's Hall. Mar. 10.—"*Whales and Whale Hunting*," illustrated by lantern slides, by Professor E. E. Prince, Commissioner of Fisheries.

Report of the Zoological Branch.

In St. John's Hall. Mar. 17,—(*a*) ANNUAL MEETING. Reports of Council, Election of Officers, etc.

(*b*) "*Additional Notes on the Geology and Palæontology of Ottawa*," illustrated by lantern slides and specimens, by Dr. H. M. Ami, of the Geological Survey.

The meetings will be held at 8 p.m. on the *second* and *fourth* **Tuesdays** of the month, except in the case of the Annual Meeting.

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