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THE BRITISH ASSOCIATION PRESIDENT'S ADDRESS, 1904.

By Prof. E. E. Prince, Dominion Commissioner of Fisheries, Ottawa.

No doubt many readers of THE OTTAWA NATURALIST will be interested to read a more adequate, if somewhat condensed, account of the remarkable address by the British Premier at Cambridge, England, last August, than the fragmentary references to it in our Canadian press. Hence the following notes have been prepared.

When that distinguished body of scientists, the British Association, met this year in England's famous seat of learning, Cambridge, it was appropriate that one of her most distinguished sons should be chosen President. The choice was unique, in that the *savant* chosen was also the Prime Minister of England. The name of Balfour is one held in special honor at Cambridge, for a younger brother of the Right Honorable Arthur Balfour was, until his tragic death in the Alps, the most brilliant biologist, excepting Darwin, that the ancient university has given to the world. The chair of Comparative Embryology, held by the late Professor Francis M. Balfour, has never been filled since his death. The reason, it has been said, is that no worthy successor has been forthcoming.

Premier Arthur Balfour has no mean reputation as a thinker and *littérateur*. The students of Scotland's oldest University (St. Andrews) elected him Lord Rector in 1886, and his rectorial address was a remarkable one in the field of literary criticism. Later, as Rector of Glasgow University, and at the present time, as Chancellor of the youngest of Scotland's Universities, viz: Edin-

burgh, Mr. Balfour has worthily sustained the distinction of his family name. His masterly treatises "Philosophic Doubt," "The Foundations of Belief," and other works, have given him eminence as a speculative philosopher. The late Principal John Caird, of Glasgow, once said, in my hearing, "It is easy to be a great philosopher in the company of scientists, and easy to be a great scientific man amongst philosophers; but Mr. Balfour is a great philosopher among philosophers, and a scientist among scientists." Of Mr. Balfour's real interest in science I have personal knowledge, and I well remember when I had the honor of first meeting him, that I was startled by his familiarity with a line of special zoological research in which I was at the time engaged, fifteen or sixteen years ago.

Cambridge which boasted a Newton, a Couch-Adams, and a Darwin in the past, and can claim to-day a Kelvin, and a Rayleigh and other leading scientists, was privileged to listen to a profound and closely-reasoned address on the Aim and Basis of Scientific Investigation from the President of the British Association, the membership of which Association this year exceeds 2,500.

The precise title chosen by Mr. Balfour was "Reflections suggested by the New Theory of Matter," and after pointing out that physical reality, not mere appearances or changing phenomena, formed the object of the highest scientific research, the President rapidly reviewed the ideas about matter which have prevailed since Newton's epoch-making "Principia" (published in 1687).

OLD CONCEPTION OF MATTER.

In the 17th century the average scientist regarded the universe as composed of ponderable matter, various in kind, permanent and indestructible: but capable of transformation by heat, chemical affinity, &c. Interstellar space in the vast heavens was conceived to be occupied by a thin, continuous kind of matter called ether, whose undulatory motions resulted in light, radiant heat, and electricity. Young's wave theory of light, a hundred years ago, led to the abandonment of such theories as Newton's light corpuscles or the emission by luminous bodies of material molecules which produced the sensation of light in the brain.

RECENT IDEAS OF MATTER.

In 1904 (a century later) the modern ideas as to the atomic and molecular composition of matter, the kinetic theory of gases, the laws of the conservation and dissipation of energy, so potent in 19th century science, have been surpassed by the latest affirmation that gross matter is, after all, a mere appearance, whose physical basis is electricity.

ELECTRICAL MONADS.

The chemist's ultimate atoms, whose groupings constitute the molecules of the chemical elements are now regarded as themselves groups of sub-atoms or monads. These are not electrified particles of matter; but are electricity itself. The different elements of the chemist are really different arrangements and motions of monads. "Thus" said Mr. Balfour, "two centuries ago electricity seemed but a scientific toy. It is by many declared to-day to constitute the reality, of which matter is but the sensible expression."

QUALITIES OF MATTER.

Formerly matter was said to have primary, essential qualities, such as shape and mass, which existed independent of any observer. It had also secondary qualities, like warmth and colour, which had no existence excepting as effects upon the organs of sense-perception in living beings. Mass is now pronounced to be no longer an attribute or a quality, but a relation. Far from being necessary and unchangeable, as was formerly thought, mass changes with every change in velocity, and especially at high rates of velocity. Professor Rutherford states that these corpuseles have a velocity in some cases 40,000 times greater than a rifle bullet which travels at the rate of about $\frac{1}{2}$ a mile per second. (*Harper's Mag.*, Jan., 1904)

FEEBLEST FORMS OF FORCE CHIEFLY APPARENT.

Chemical affinity, molecular cohesion and the like, hitherto so important in the eyes of the physicist, are mere residual effects, the feebler manifestations of force as compared with the immense electrical forces which keep the atom in being. Gravitation, Newton's imposing discovery, is trifling compared with the attractions and repulsions of electrically charged bodies, while these, again,

are insignificant as compared with the internal attractions and repulsions of the electric monads. Each atom of matter is the theatre of energetic forces, however inert may be its external relations.

UNITY THE AIM OF SCIENCE.

"Will this bold attempt to unify physical nature last?" asked Mr. Balfour. A world built-up out of sixty or seventy eternally different chemical elements is just as rational a conception as if it were constructed out of a single medium: but men of science have always been impatient of multiplicity. Reduction of plurality to unity is a scientific instinct not to be ignored.

EXPERIENCE UNTRUSTWORTHY AS A SCIENTIFIC BASIS.

The President then considered the basis of experience upon which scientific research founds its laborious investigations. Scientists formerly held that to go behind experience was impossible, yet Faraday's disbelief in that *dictum* led to the modern electrical theory of matter. Gravity itself, says the physicist today, must be explained, it is no longer held to be an ultimate property of matter admitting of no explanation and requiring none. Matter itself, in masses or in minute particles, molar or molecular, is resolved by recent science into that which is not matter at all. The minute particle, called the atom, is a relatively vast theatre in which the sub-atoms or electrical monads perform their evolutions. The minuteness of these monads may be judged from Prof. J. J. Thomson's statement that radium throws off, as cathode rays, streams of these corpuscles, each of which has a mass of about one-thousandth part of the hydrogen atom and thus they are the smallest bodies known to science. (See *Harper's Mag.*, l. c. p. 279).

SCIENCE CONTRASTS WITH COMMON EXPERIENCE.

Matter, as viewed by scientists, could hardly be more divergent than it is from prevailing ideas or common experience, yet all science must inevitably be based upon experience, which is really but another name for the perceptions of the bodily senses.

EXPERIENCE WHOLLY ILLUSORY.

Starting from experience, scientific thought yields conclusions which prove experience to be misleading. "Our knowledge of reality" Mr. Balfour pointed out, "is thus based upon illusion,

and the very conceptions by which we describe it to others or think of it ourselves are abstracted from anthropomorphic fancies, which science forbids us to believe and nature compels us to employ."

INDUCTIVE THEORY INADEQUATE.

The school of John Stuart Mill held that the task of science ended if the sequences of our individual sensations were accounted for. Mill's "Logic" dealt with succession and co-existence in phenomena, with methods of agreement and difference, with the laws of nature as observed uniformities and nothing more. The inner character of physical reality was of no concern to science. This "thin intellectual fare" as the President styled it, is what was served out under the imposing title of Inductive Theory.

IF BODY AND MIND ARE EVOLVED WHAT FOLLOWS?

Our organs of sense (eyes, ears, touch, &c.) inform us that there is a physical world: but science says the constitution of our organs, our eyes, our ears, &c., whose reports are really sense-perceptions, has reached its present condition by evolution or natural selection. So also have our intellectual powers. Utility has decided everything; what is fittest alone survives. Man's physiological and mental outfit, adapted to the highest scientific inquiries, are due to blind forces, which have no prevision of loftier uses. The rudimentary instincts of the animal have thus been perfected into powers of analysis and calculation enabling man to mete out the heavens or divide the atom. The imperfection of man's ordinary beliefs and ideas, based upon illusory experience, may be due to these circumstances and to this genesis. Too accurate and direct a vision of physical reality might have been a disadvantage in the struggle for existence. Falsehood being, perhaps, more useful than truth, and living tissues (composing the organs of sense) being such imperfect material, no better results could be attained. This applies to the senses: but it must also apply with equal force to the intellectual powers.

SCIENCE GIVES NO COHERENT INTERPRETATION.

If evolution thus provides man with untrustworthy instruments for obtaining knowledge, or rather sensations, the raw material of experience; why should it succeed better in regard to reason, whose task is to turn experience to higher account.

Evidently something is wrong with the purely scientific explanation of the acquisition of truth and reality. As Mr. Balfour declared, there is "a certain inevitable incoherence in any general scheme of thought which is built out of materials provided by natural science alone." Knowledge, which science regards as the final outcome of irrational (animal) conditions, must be pronounced essentially rational, or science itself disappears.

As the speaker claimed, in an eloquent passage :—

"Extend the boundaries of knowledge as you may ; draw how you will the picture of the universe ; reduce its infinite variety to the modes of a single space-filling ether ; retrace its history to the birth of existing atoms ; show how under the pressure of gravitation they became concentrated into nebulae, into suns, and all the host of heaven ; how at least in one small planet, they combined to form organic compounds ; how organic compounds became living things ; how living things, developing along many different lines, gave birth at last to one superior race ; how from this race arose, after many ages, a learned handful, who looked round on the world which thus blindly brought them into being, and judged it, and knew it for what it was—perform, I say, all this, and, though you may indeed have attained to science, in nowise will you have attained to a self-sufficing system of beliefs."

Thus, the more complete seems to be our explanation of what we know, the more difficult it is to discover by what ultimate criteria we claim to know it. The President concluded by confessing that the dilemma was not one for physical science to remove, for here the confines of a territory were touched where philosophy claims jurisdiction.

If the senses and instincts of the lower animals are inadequate to yield a true conception of the universe in which we find ourselves, and if these, more refined and highly developed in man, are still unreliable and misleading in the ordinary human mind at any rate, and furnish, under the name of "experience" or "common sense," grossly erroneous conclusions as to the realities of existence, the resulting paradox is strange indeed. The latest product of human evolution, the scientific intellect, in its highest and most daring flights, is compelled to rely more and more, not upon actual common experience, but upon idealistic interpretations of the universe. Such interpretations transcend the crude reports of sense-perception : but they mould the results of experience and sense-perception into harmony with ideas, preconceived and necessary and full of light and satisfying meaning.

DISCOVERY OF THE EGGS OF SOLITARY SANDPIPER.

By WALTER RAINE, Toronto.

At last the long-sought for eggs of the solitary sandpiper have been found and it affords me much pleasure to be the first ornithologist to have the opportunity of recording its nesting habits, which are unique amongst North American birds, for I have positive proof that this species lays its eggs in the nests of other birds; this being one of the most important discoveries in recent years in regard to the nidification of any American bird.

In "Nests and Eggs of British Birds Non-Indigenous," Mr. Chas. Dixon says of this species:—

"Incredible as it may seem the nest and eggs still remain unknown to science, for it is impossible to accept the description of the latter given by the late Dr. Brewer without authentication. There can be little doubt that this species lays its eggs in the discarded nests of other birds in low trees like its old world representative the green sandpiper is known to do, search should be made in such places in the summer haunts of the species."

I am aware that other ornithologists have previously recorded what were supposed to be eggs of the solitary sandpiper, but most of these records were simply conjecture and very unsatisfactory. The egg recorded by Dr. Brewer, according to the description that he gives, was doubtless that of the piping plover, the nest being found on the ground, and it will now be seen the solitary sandpiper does not make its nest on the ground.

Another supposed nest of this species was recorded by Dr. Clark of Kingston, Ont., in "The Auk" for Oct., 1898. This same nest was also recorded in THE OTTAWA NATURALIST for December, 1899, by the Rev. J. C. Young, but this nest was found on the ground and the parent was not secured. Mr. C. A. Reed in his work "North American Birds Eggs," figures one of these eggs found by Dr. Clark and it resembles a variety of the spotted sandpiper. The eggs of the solitary sandpiper are larger and more pear shaped than any spotted sandpiper egg I have seen, and the texture of the shell is very different to that of the spotted sandpiper, being a fine grain and polished; then the ground color is pale greenish white, a tint never seen in a spotted sandpiper egg.

The genuine eggs of the solitary sandpiper are entirely different from spotted sandpiper eggs, in fact there is no American sandpiper egg that has the slightest resemblance to that of the solitary sandpiper. They bear a family likeness to eggs of the European green and wood sandpipers as might be expected, but of course like the birds themselves, the eggs are smaller than those two species of European sandpiper.

Now for my records which are absolutely authentic and thoroughly conclusive and establish once for all the fact that the solitary sandpiper does not lay its eggs on the ground, but deposits them in the nests of other birds often at considerable distance from the ground.

In the spring of 1903, I engaged Mr. Evan Thomson, to collect birds eggs for me in northern Alberta, and when the season was over he sent me notes on the specimens he had collected, amongst which was a record of finding a clutch of sandpiper eggs in an old American robin's nest built in a tree top.

I felt sure these would turn out to be eggs of the solitary sandpiper, and in due time the eggs were sent down and I saw at a glance, the eggs were new to me, but as they very much resembled a set of green sandpiper eggs in my collection, except being smaller in size, I was sure I had at last secured a genuine clutch of solitary sandpiper eggs. Several ornithologists who called to see my collection of birds eggs confirmed my opinion that this was a genuine set of this species. Amongst those who saw them, I may name the Rev. C. J. Young, Madoc, Ont.; Mr. Ed. Arnold, Battle Creek, Mich.; and Mr. Ed. Reinecke of Buffalo, N.Y.; but I thought I would wait for another year in the hope that Mr. Thompson would find another clutch and secure the bird, and in this he was very successful; as the following letter shows:—

“This season on June 9th, I found another set of solitary sandpiper eggs, this time in a grackle's nest in a low tree. I blew the eggs and left them until the next day, intending to return with my gun and shoot the bird, but on again visiting the nest, I found the eggs had gone, evidently the bird had removed them as I saw no trace of egg shells around. However, on the 20th June, I was still more fortunate, as I found another clutch and shot the parent bird as she flew from the nest and secured the four fresh eggs

This time the eggs were found in a cedar waxwing's nest in a spruce tree out in a swamp or muskeg."

The following is a description of these nests of solitary sandpiper eggs.

SET I.—Taken in northern Alberta, June 16th, 1903. 4 eggs advanced in incubation, collector, Evan Thomson. This set was found in an old nest of the American robin, built 15 feet up in a tamarac tree, that was growing in the middle of a large muskeg, dotted with tamaracs, the bird was flushed off the nest but unfortunately not secured. The eggs are exceedingly handsome and very different from the eggs of any other American sandpiper. The ground color is pale greenish white, heavily blotched and spotted, chiefly at the larger ends with vandyke brown, chestnut brown and purplish grey, the average size of these 4 eggs is 1.36 x .98, and they are very large for the size of the bird.

Set II.—Northern Alberta, June 9th, 1904. 4 eggs found in the nest of a bronzed grackle, built in a low tree; these eggs were unfortunately lost owing to Mr. Thompson first blowing them and then leaving the shells in the nest until he returned with his gun to secure the parent bird, but on his return on the following day, no trace of the eggs were to be found, the bird evidently had carried them away.

Set III.—Northern Alberta, June 24th, 1904. 4 eggs found in the nest of a cedar waxwing, which was built in a small spruce tree growing in a swamp, the nest being about 5 feet from the water, and Mr. Thompson was fortunate in shooting the parent bird as she flew from the nest, and thus identification is very complete and established the fact once for all, that the solitary sandpiper does not lay its eggs in a nest on the ground like other sandpipers, but takes possession of the nest of other birds, built in trees, just the same as its old world representative the green sandpiper is known to do.

The ground color of this clutch is also pale greenish white and the eggs are spotted with purpled brown, vandyke brown and purplish grey, and average in size, 1.36 x .99, thus it will be seen they average larger than eggs of the spotted sandpiper which measure about 1.34 x .90. Both clutches with the skin of the parent solitary sandpiper together with the nests are now in my

collection for the inspection of ornithologists. The finding of the eggs of the solitary sandpiper now makes the seventh species whose eggs were unknown to science until discovered by myself and assistant collectors in northern Canada. The other species whose eggs were previously unknown are Richardson's merlin, greater yellowlegs, belted piping plover, Nelson's, Leconte's and Harris's sparrows. The four latter species we found nesting in Manitoba, while the eggs of Richardson's merlin and the greater yellowlegs were discovered in Alberta.

OBSERVATIONS ON SOME OF OUR RARE BIRDS MET WITH IN 1904.

By Rev. C. J. YOUNG, Madec, Ont.

In an earlier number of the OTTAWA NATURALIST, I recorded the appearance of the evening grosbeak in the neighborhood of Kingston in the months of February and March; also of the appearance of the horned lark at its usual time in spite of the bitterness of the winter. I will now refer to a few birds I met with this past season.

The goshawk is a not uncommon winter visitor to Ontario; it breeds occasionally, and is one of the earliest of our hawks to do so. I have previously recorded a nest found near Perth in 1885. On the second of May, it contained three eggs, incubation commenced. On the 22nd April, in the present year, a nest was located in the township of Oso, while snow was still deep in the bush, and the ice on our lakes was strong enough for a person to cross; at that date the nest contained three fresh eggs, unspotted and of a decided bluish tint. Both of these nests were located in beech trees about 45 feet from the ground, as also was one observed in the township of Elzevir, which in June contained two well grown young ones.

The red-shouldered-hawk breeds regularly in N. Frontenac, but the further one goes north, the rarer this bird becomes. It is also an early breeder, laying in the latter part of April, and selecting any suitable tree, very often a maple, sometimes an ash, oak,

beech, elm, pine or hemlock, in all of which trees I have seen the nest.

The red-tailed-hawk is quite rare in eastern Ontario. I have no knowledge of its nesting along the St. Lawrence though I have seen the bird. In the rougher parts of the country northward a few pairs do so, and this year a nest was located in the township of Olden, in a high black ash, which on May 21st contained two eggs, highly incubated.

The vicinity of Sharbot Lake is the summer home of many warblers, and some of the fly-catchers. Of the latter I have observed the king bird, the great-crested, the olive-sided, the wood peewee, the phoebe, Traill's fly-catcher (Var. alnorum), and the least fly-catcher. Of the former, the yellow warbler, the myrtle warbler, the magnolia warbler, the black-throated green, the black-throated blue, the blackburnian, the palm warbler, the Maryland yellow-throat, the oven bird, the water thrush, the Canadian warbler, and the red-start, along with two or three varieties, that I could not identify, are frequent. All the above breed, and during the past season, I saw nests of magnolia, June 6th, in a small black spruce, containing four young ones just hatched; on the same date a black-throated-blue warbler's in a maple sapling, with two fresh eggs; also a red-start's with four eggs; and on May 27th, a water-thrush's just ready for eggs. But none of these birds is rare compared with the olive-sided fly-catcher, which I located on the 6th June, in the same black spruce swamp, where I found the magnolia warbler. In the open spaces, patches of arctic huckle-berry grow round the scattered spruces, and amid the springy moss, were the largest pitcher-plants then in flower, I had ever seen. A short distance away, outside a belt of spruces were many plants of the beautiful lady's slipper, *Cypripedium acaule*; and not far off the bright waters of Sharbot Lake. In a black spruce eighteen feet high, the olive-sided fly-catcher had established his home. The nest was built on a horizontal bough thirteen feet from the ground, and on June 6th, contained two eggs. Later, in the swamp on June 23rd, I found another of these nests containing three eggs, incubation commenced. It probably belonged to the same pair of birds, as it was no more than fifty yards from the first nest, but was built in

a much larger black spruce, on a horizontal bough, twenty-five feet from the ground. I had never seen this bird in its breeding habitat before, or had even met with it. On the above occasion, while walking through the little swamp, my attention was attracted by its loud and singular call or alarm note. It would sit on the topmost dead branches of the trees and rapidly repeat three times syllables, which one writer compared to 'quirk,' 'quirk,' but which I thought more resembled three creaks of a rusty door hinge. The bird is very restless in the vicinity of its nest, continually on the move; the nest itself is built of small, dry tamarac and spruce twigs, interwoven and lined with tree lichen and moss.

I might mention several other birds as met with in this locality, but space forbids, so I must leave them for the present; I will only refer to the solitary sandpiper. I wrote a short paper on this bird, which appeared in the OTTAWA NATURALIST, of December, 1899. There I stated my observations on the bird up to that date (1899) and concluded with an account of a nest and three eggs found by me near a creek on Amherst Island, the identification of which I considered at the time absolutely indisputable. The nest was on a sandy knoll, near a creek; the flight of the bird was peculiar, but what I most of all relied on, were the evident whitish features of the tail.

Subsequent developments however, lead me to suppose that my identification was faulty, for Mr. W. Raine of Toronto, received from Alberta, two sets of eggs, taken from the disused nests of other birds built in trees, which if his correspondent is correct, certainly belong to this species. I have seen one of these sets of eggs and am impressed with their resemblance to eggs of the greenshank, green and wood sandpipers of Europe, but of course they are smaller, as they should be. It should be remembered that Mr. Charles Dixon, the writer of 'non-indigenous British birds,' in writing of this species some years ago, said "there can be little doubt that this species lays its eggs in the deserted nests of other birds in low trees, like its old-world representative, the green sandpiper, is known to do." Dr. Brewer's record and my own with regard to these eggs are unsatisfactory.

As a supplement to my former paper, I may add I did not meet with the solitary sandpiper after 1899, until May 22nd, 1903, when

I saw a bird at a small lake in the township of Olden. This year 1904. I saw an unmistakable bird in immature plumage, with down still adhering, rise from a pool by the road-side in dense woods in the township of Kennebec, on 6th July. But as proof of their breeding in this part of Ontario, I will relate my experience this summer near Madoc, in the county of Hastings. I was driving past a road-side pool near a swampy meadow on 24th August, when several sandpipers rose, and alighted on the neighboring fence. I stopped the horse and watched them. They were a brood, four young with the two old ones: were very tame; they would fly down to the muddy pool, then alight on the fence again, would sometimes perch on a stump on the dead branch of a neighboring tree. I could get within eight or ten feet. I thought a photograph would be interesting, so I came another day, but could never get more than two on the fence together. I obtained photographs to that extent, after visiting the location on several afternoons. The last time I saw any of them was the 16th September. This brood was doubtless hatched in the vicinity, and having been undisturbed, will probably locate themselves there another year, if they survive the migration. I have heard from boys, whom I met near by, of a snipe's nest having been found last spring in an apple tree, and was assured by them that the bird flew out, and until they saw this nest they always thought the snipe made its nest on the ground. This had reference to the solitary sandpiper.

But not much dependence can be placed on such a statement, and until I see the nest, and examine any fragments of egg shell there may be in it, I only mention the statement for what it is worth.

Madoc, September, 1904.

THE CANADA JAY.

(By WM. H. MOORE. Scotch Lake, N.B.)

The Canada jay (*Perisoreus canadensis*) is one of our Canadian birds which is blessed with several local names. Some of these names are "camp-robber," "whiskey-jack," "moose-bird," and "gorbie," but speak of this bird as Canada jay to most of his human acquaintances and they know not what bird is meant.

The Canada jay is one of our most hardy birds. So hardy in fact, that not only do the adults withstand our severe winters, but they even build their nests and bring forth the young while snow still covers the ground. The nest is a compact affair, built of twigs, fine shreds of bark, and hair, and if wool is obtainable it is added.

The plumage of the young, is much darker than that of the adults, being sooty black throughout with a slight tip of white on tail feathers. The white of the head and neck is lacking until August or September, when they have assumed the same colored dress as the older birds, being greyish with white cheeks, throat and collar, forehead, and tip of the tail. When on the wing they seem to float on the air, rather than to be working vigorously with the wings as some birds do. A cause of prejudice against the Canada jay is the manner in which at times they obtain their food. They are much disliked by trappers and hunters, as they often take the bait from traps set for fur bearing animals, and also by feeding upon carcasses of game hung up by hunters. Many hunters have lost shots at game on account of this bird giving a cry of alarm when it sees a man, and as all of the wild neighbors partially understand the calls and actions of their friends, all know to be on the *qui vive* when an alarm call is given. Campers also dislike its way of taking any bit of food that it can carry away, yet some campers delight in feeding the birds just to see them eat, and carry away what they cannot eat. Anything from a small bone, bread-crust, or piece of soap is acceptable to their needs; whatever it may be, it is picked up in the bill, and while on the wing it is changed to a foot, and changed as easily

as you or I could change a like article from one hand to the other. But all do not live all the time by camp robbing, or trap-robbing. If they did many of the names applied to them would be well earned.

Let us see the Canada jay from an economic, a beneficial point of view. This will bring to light other habits and a different food supply. Small mammals, killed by the birds themselves, are part of the bill of fare, and insects in all stages of life form a large part of the menu even among camp fed birds.

The writer performed a surgical operation upon a Canada jay which had been in the habit of dining with a crew of lumbermen, and was much surprised to find that nearly one thousand eggs of the Lorset tent-caterpillar had been taken for breakfast. The chrysalids of this caterpillar are also fed upon, and in the autumn while the birds are migrating south they feed largely upon locusts, beetles, etc. The young taken in June feed upon beetles and caterpillars, species well known to the birds but unknown to the writer.

What real naturalists our wild birds are, knowing how, when and where to find and obtain their food supply, be it insect in any of its stages, plant forms, or other life. Were we able to understand our wild neighbors what a great amount of information could be gained regarding the life histories of many forms of life.

A most interesting entertainment to witness is when the Canada jay turns his attention to collecting mice. Not only is it interesting to witness but from appearances the performances is highly interesting to both jay and mouse. A Canada jay was heard shrieking and calling in such a manner as to call the attention of man. A mouse had been running over the snow from one burrow to another when it was espied by the sharp eye of the jay, who immediately gave battle by flying down and catching the mouse in its bill, whereupon the mammal turned upon its foe and prepared to defend itself by trying to bite the bird, but the jay seemed aware of such tactics and suddenly dropped its prey. The mouse sprinted for cover, but was again held up. These tactics were followed until the mouse had become too badly injured to run, when it was most viciously seized and pecked to death. With screams of vic-

tory the jay made his way to a stump where the mouse was added to various other products of Nature in the internals of *Perisoreus*. To sum up both sides of the case, for and against the Canada jay, I for one think we should put down the verdict thus : Canada jay highly beneficial from the habit of feeding upon insects and mammals injurious to the welfare of man.

There are three sub-species of the Canada jay, viz : (*Perisoreus canadensis nigricapillus*) having a blackish crown. Inhabiting the the coast region of Labrador north to Ungava Bay. (*P. c. fumifrons*.) in which the white of forehead is smoky colored, inhabiting Alaska.

(*P. c. capitalis*.) The white species, especially about the head, larger than *canadensis*. Rocky mountain region of U. S.

BIRD NOTES.

RUFFED GROUSE.

Dr. Fletcher's note in the December, 1903, number, reminds me of a similar incident which occurred some years ago at Beacon Hill park here, during the progress of a cricket match. One of these birds was flushed by a dog on the opposite side of the park and came flying over the field where it was terrified by the shouting and yelling of the crowd. It made straight for the nearest cover, where the Park Hotel stood, flying at a great velocity. The hotel door stood open and just opposite was a large mirror, the poor bird went through the door and against the mirror, falling dead on the floor.

J. R. ANDERSON.

Victoria, B.C., 4th January, 1904.

BIRD MIGRATION.

Mr. E. A. Wright of Ottawa, noted on the morning of October 9th, at 3.35 a.m., a migration of many thousand birds which from their note he took to be some species of plover. They continued to pass over for about an hour, when he fell asleep. Mr. Wright noted that the birds seemed to be flying very low, and from the difference in their note it was evident that some of them rested for a short time.

J. M. M.

NATURE STUDY—No. XVIII.

THE PRESCRIBED COURSE IN NATURE STUDY FOR PUBLIC SCHOOLS.
S. B. SINCLAIR, Ph. D.

The Easter meetings of the Ontario Educational Association held in Toronto, have for several years been devoted almost entirely to the consideration of new courses of study for Public and High Schools.

As a result of this investigation the regulations regarding the subject matter of study in these schools have been greatly changed. One of the most radical of the reforms made is the introduction of Nature Study into every grade of the Public School. The December number of the *NATURALIST* for 1903 contains an outline of the course which was proposed. As a number of alterations were made before adoption it has been thought better to give the following copy of the revised courses, which are now compulsory in the first four classes of the Public School.

Form I.

NATURE STUDY.—Animal life : General appearance and habits of pet animals, their care and food ; domestic animals on the farm, their care, habits and uses ; birds, their nesting, song, food, migrations in the autumn ; metamorphosis of a few conspicuous butterflies or moths.

Plant life : Work in school garden or in window boxes ; study of a plant, as a geranium or pansy, from slip or seed to flower ; caring for plants in pots ; buds, their preparation for winter, their development ; autumn leaves, collections, forms, tints ; economic fruits, collection, forms how stored for winter, fruit as seed holders, dissemination of seeds ; roots and stems, uses, comparison of fleshy forms, how stored for winter.

Life on the Farm : Harvesting, primitive and modern methods compared ; preparation for winter ; the barn and its uses ; activities of the farm during winter ; winter sports and social life on the farm ; the varied operations of spring time ; spring time as awakening to new life ; effects of sun and moisture on the soil.

Form II.

NATURE STUDY.—Course of Form I. continued. Animal life : Life history and habits of domestic animals and of a familiar wild animals, as the squirrel, chipmunk, robin, crow ; earth-worm, habits, structure, uses ; toad, habits, structure, uses ; observation of live insects and their activities, comparison of young and adult stages.

Plant Life : Co-operative and individual work in school garden ; cultivation of plants in pots with observation of the development of leaves and flowers, parts of leaves and flowers ; change of flower to fruit and of fruit to seed ; functions of the parts of flowers ; the forms and uses of trees ; activities connected with forestry and lumbering, with study of pioneer life and present conditions on the prairie.

Observation of farm, garden, and household operations.

Form III.

NATURE STUDY.—Course of Form II. continued.

Animal Life : Adaptation of different kinds of Animals to their respective habits and surroundings ; birds, life history of types, habits of wild fowl in different seasons ; fish, forms and uses of different parts of the body, food and how obtained ; life histories of moths, butterflies, beetles and grass-hoppers ; useful insects, as ladybird and dragon fly ; harmful insects ; Nature's insecticides.

Plant Life : Germination of seeds under controllable conditions and in the school garden and window boxes ; opening of buds ; study of the forms and functions of the parts of plants, and comparison of these forms and functions in different plants ; observation of the culture of farm and garden crops and of orchard and shade trees ; the observing and the distinguishing of the common forest trees.

Different kinds of soil, as sand, gravel, loam, leaf-mould and clay ; experiments to ascertain how soils are composed, whether of mineral or of decayed organic material, and which best retains water. Additional phenomena of spring in the vicinity of the school, cause of snow melting, ice floating, etc. ; how nature prepares the soil for growth of plants. Distinction between hard and

soft, pure and impure water ; tests and methods of impure water ; tests and methods of purification of water.

Sources of heat : Experiments to show the effects of heat in the expansion of solids, liquids, and gases ; practical applications. Temperature ; thermometer, construction and graduation Methods of transmission of heat, conduction, convection, and radiation ; causes of winds and ocean currents ; ventilation.

Form IV.

NATURE STUDY.—Course of Form III. continued Animal life ; relation of fish, birds, and wild animals to man ; life histories of conspicuous and economic insects ; organs and functions.

Plant life ; study of organs of plants and their functions ; study of economic and wild plants from seed to fruit in the school garden, home garden, farm and forest ; weeds injurious to crops and methods of destroying them ; buds and twigs : wood, rings, grain, and bark, uses, etc.

Observing local minerals and rocks, their properties and uses ; experiments to show composition of soils and their relation to drainage, temperature, etc. ; varieties of soils adapted to different crops ; fertilizers, etc. Implements and tools used on the farm and in the household, mechanical principles applied in their construction.

The atmosphere ; its composition ; combustion, simple experiments, study of candle flame products ; changes produced in the air by respiration ; reciprocal relation of plants and animals as regards the atmosphere ; impurities in air.

Gravity ; air and liquid pressure, the barometer. Cohesion and adhesion. the nature of these forces ; phenomenon of solution and diffusion ; amorphous and crystalline forms of matter. Practical use of heat, steam, and electricity, in connection with the study of industries.

Form V.

ELEMENTARY SCIENCE.—An elementary course in Botany, Zoology, and Physics.

For the details of the course, see Appendix B., p. 82 of printed Regulations of the Education Department of the Province of Ontario.

NOTE 1.—The objects of the course are to train pupils in correct observation and deduction; to give, in connection with the instruction in Geography, a fair knowledge of the world around them to those who will remain at school only a year or so; and to lay the foundation for the more detailed study of each subject in the case of those who will continue the work. The spirit of the Nature Study of the lower form should be retained, but the teacher should introduce a more systematic treatment of the subject with organization of the material in Botany and Zoology as will lead to simple classification. The course should be correlated with Geography, Drawing and Composition.

NOTE 2.—Under each of the sub-heads in Appendix B, full details are given of the courses. The order of the topic, however, is merely a suggested one. In Botany and Zoology, the extent and the character of the details of each topic are left to the principal and the teacher, and should be determined by the accessibility of the material and other local considerations. The course in these subjects should be practical throughout. Each pupil should possess a good lens and be taught how to use it. Approved methods of collecting and preserving botanical specimens and of keeping live animals suitable for study should be systematically followed. An herbarium and a museum of local specimens should be provided where practicable. The pupils should be encouraged to provide specimens from the locality. Much of the practical work, especially the observations, will necessarily be done out of doors by the pupils alone, under the direction of the teacher, or by the pupils, conducted by the teacher. The course in Physics shall be experimental as far as possible, and the pupils should be encouraged to work at home and to prepare simple apparatus. The amount of the apparatus required is at the discretion of the Public School Inspector.

NOTE 3.—Books for reference and for supplementary reading should be provided in the school library. Systematic written descriptions and drawing should be required throughout the course, and the exercises should be dated and presented for comparison and inspection, the work being systematically supervised by the teacher. In none of the science subjects shall notes be dictated by the teacher.

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