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# THE OTTAWA NATURALIST.

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VOL. XVIII.

OTTAWA, JUNE, 1904.

No. 3

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## NESTING OF SOME CANADIAN WARBLERS.

By WM. L. KELLS, (Third paper.)

### THE MOURNING WARBLER.

(*Geothlypis philadelphia.*)

The mourning warbler though not abundant in any district, is yet pretty widely distributed over the province of Ontario, as well as other divisions of eastern Canada, but it is among the last of the family to announce its vernal advent amid the wild scenery of its summer haunts. Usually, when the expanding buds of the lower underwood are bursting into leaves; when the yellow bloom of the leatherwood scents the spring-time air, and the virgin soil of the forests being variegated by the early wild flowers of the season; the observer of bird migrations, if in the vicinity of its chosen summer home, will be enabled by the sound of its song, to add to his list, this species as among the more recent arrivals from the sunny south; but as the month of July advances, its nesting period is over; its notes for the season are silent; and the bird itself appears to be among the first of the members of its family to take its departure from the uncultivated scenery of its summer home; and begin its aerial voyage towards its tropical winter residence in the regions of Central America. Here it enjoys the pleasure of existence amid perpetual summer, during that portion of the year when its Canadian father-land feels the chilly breath of the ice king, is covered with a mantle of snow, and swept by the wild storms of winter. In March it begins its northward journey, but two months pass away before it reaches the terminus of its winged voyage in the regions of its northern range, and summer home, and here begins again one of the chief objects of its migration movements *i. e.* the propagation of its species, and when the period in which this can only be done is over the impulses

to return towards the south seem strong, and to yield to the impulses of nature in this matter is not long delayed; for by the middle of September, if not earlier, all this species—and its genus have disappeared; though some individuals may linger longer amid the scenery of their summer haunts in the thicket and the swamp, than is now known.

The haunts and home of the mourning warbler, during the period of its residence in Canada, are generally on the margins of low-land woods, or second-growth swamps, where there is an intermingling of young underwood, fallen brush, and raspberry vines. It may also occasionally be found to frequent wooded ravines, the sides of brush-covered hills, and the margins of muddy creeks which meander their courses through what are called "beaver-meadows," where there is deep concealment; and here, amid the deep foliage, one strain of the song-notes of the male of this species, may often be heard, in the mid-summer days, while the little performer itself is invisible. At times he will rise to a considerable elevation, and after a pleasing performance of quite a different series of musical notes, in the ventilation of which he appears to take much pleasure and pride, and during which he makes a rain-bow like circuit, and takes a rapid descent into the thicket below, near where it is probable the female has a nesting place. Another particular haunt of this bird is small clearings in tracts of hard-wood forest, and along the sides of road-ways, through primitive woods: but it is seldom observed out in the open fields, except in the backwood settlements, nor does it often approach the garden or other environments of human habitations, and except where the woods are open, it will not be found deep in the forest, but as the original forests of Southern Ontario are fast disappearing, time will no doubt effect great changes in the summer haunts of this species. In eastern Canada the mourning warbler does not appear to advance further north than the Gulf of St. Lawrence, and the valley of the Ottawa river; but in the western portion of its range—which extends to the foot-hills of the Rocky Mountains—it appears to extend its summer range to more northern latitudes, and higher altitudes than in the east.

Too little is yet known of the nesting history of this warbler to enable the investigator to decide whether it deposits more than

one set of eggs in the breeding season: certainly its nesting period in Canada would not allow of it raising more than one brood during its stay in this country, but where the first clutch of eggs is taken, it will doubtless nest a second time. But, considering the many enemies among the smaller mammals, birds of prey, and reptiles, to which its eggs and young are exposed, it is doubtful if even one brood is raised by the majority of the pairs that cross our national boundary with each return of spring; even in the most protected localities; though the progress of civilization is rather in favor of its increase, except from the presence of the domestic cat; and yet it is wonderful how some nests of our garden-frequenting birds will escape the attention of this feline foe. The chief protective means resorted to by this species is by selecting a deep shady spot, either among the thick herbage, vines or young underwood, on, or near the ground; and then, after incubation has begun, and when the female becomes aware of danger, she does not fly directly from the nest, but quietly runs off among the surrounding shade, and does not take wing till some distance away, nor does she return to her charge till she thinks the danger is over. These efforts to protect her progeny, are, so far as human kind are concerned, so successful that very few of its nests are ever discovered; and its eggs are, and are ever likely to remain, a rarity in oological collections, but the case is very different with the lower orders of carnivorous mammals and snakes which are ever on the search to find and devour the eggs and young of every species that comes within their reach. In this charge the red squirrel, the chipmunk, the weasel, the mink, the skunk, and the fox, are among the chief transgressors that range the haunts of the warblers, while, nearer human habitations, cats, rats, and even mice, do their deadly work; and no enemy of all the warbler family is more to be dreaded than the vagabond cow-bird.

During the past twenty years a number of the nests of the mourning warbler have come under my observations, and the finding of these has been rather accidental than the results of continuous field and forest research; but the last of these noted up to the end of the season of 1902, is the first to which attention will here be directed. On the 8th of June, 1902, when strolling across a piece of recently cleared fallow, now over-grown with raspberry

vines, on the northwest corner of *Wildwood Farm*, a small bird flushed out from a thicket of vines within a few feet of where I was passing. A little research revealed a new-made nest, which I inferred belonged to a mourning warbler; though at the time I had got only a glimpse of the builder; yet, though all the members of this genus of the warbler family compose nests, and deposit eggs much alike, there is always some variation on the part of each species, by which the attentive student of bird architecture can distinguish the owner, even in most cases without seeing the bird, much less without resorting to the crime of murdering the mother, and in this section of country I know of no other member of the family except the Maryland yellow-throat that nests in a similar manner and situation; and even between these near relatives there is a distinguishing difference which will be noted hereafter. This nest was not sunk in the soil, nor yet in the herbage in which the builder evidently desired to conceal it; but its foundation rested on some dry vine stalks elevated a few inches above the ground; and the first strata was formed of dry leaves and vine stalks placed loosely over each other, and not pressed down in the centre, as is the manner of the *Marylander*. On the top of this mass of dead leaves and stalks, and partly supported by the growing vines, the nest proper was placed. This was quite compactly put together, as though the materials were damp with rain, or the morning dew; when used by the builder, and may have been further moistened by the saliva of the bird when engaged in placing the particles together. The materials used were mostly dry leaves, fine fibres of vine stalks, rootlets, and some cattle hair. The inside was about two inches in diameter, by one and a half deep, the top of the nest was quite open, there being no artificial attempt at concealment, as is the habit of the Maryland yellow-throat. Six days after, I revisited this nest, the mother bird was at home and on flushing she did not rise on the wing, but ran off among the herbage in a mouse-like manner, for about 20 feet, when she rose and took a position on the top of a log, about two feet off the ground, and here she remained about a minute, twitching her wings and tail, a peculiarity of this species when excited. She flew off and disappeared in some underwood; but on neither occasion did she utter a note that I could hear, but there was no doubt of her

identity as a female mourning warbler, for parting the canes and viewing the nest I found it contained four beautiful fresh eggs; but I inferred that the set was complete and incubation begun. The general color of these eggs was white, with a rosy blush, but less dotted with reddish brown spots than have been other sets of the eggs of this species previously observed.

Since the early years of our family settlement in the township of Peel, I had been acquainted with the appearance of this species, and acquired some knowledge of its life-habits, for it was almost the only member of its family that made its summer home amid the thick brush-wood, and partly cleared spaces along the banks of the little meandering stream that intersected the homestead farm where I passed my boyhood years, and in those early days of our pioneer life in the Canadian back-woods, it was known to me as "the linnet" for some of the elder members of our family stated that it resembled a little bird called by that name in our native land, and during those early times I often saw its nesting places, but of these I have know only dim recollections. During my nine years residence in North Wallace I failed to identify this species among the avifauna of that section; though I noted several other members of this family that to me were previously unknown. After coming to Listowel in the spring of 1874, and devoting more time and attention to the life-histories of our birds, I soon again recognized my old friend of by-gone years, but for a time I confounded it with another species. In this vicinity I found the mourning warbler to be a tolerably common summer resident, but its presence is usually confined to the margins of certain lowland woods; and one June-time day when investigating the avifaunian life of a certain tract of forest, to the southwards of the town, our dog flushed a female of this species, which from her notes and excited actions, I inferred had a nest near by; but which at the time I failed to find. Returning some hours afterwards the bird was again flushed, and after a little search, the nest containing five eggs, was found. This was placed in the butt end of a cedar tree that had been uprooted, but from which the earth had fallen away, the site being about eighteen inches above the ground; this nest was a bulky affair, and loosely put together; being composed of dry leaves, weed stems, vines, rootlets and lined with

hair. This was the first nest of this bird that I discovered of whose identity I was certain. Since then a number of the nests of this species has come under my observations, but nearly all of these were placed among growing vines, and mostly raised off the ground, like the one first described. One however, was placed in a clump of sedge grass, growing in low ground that earlier in the season had been covered with water.

In the "Biological Review of Ontario," published by the Canadian Institute in Toronto, 1891, is an article from me on a nest of the mourning warbler taken that season, which I here reproduce.

"On the 28th of May, as I was doing some work on the margin of a swampy burn, and the highland wood on our farm, I discovered in a clump of yellow-topped weeds a newly made nest, of whose ownership I was at first uncertain, as it seemed to be rather large for any of the warblers that nested in such situations. On the 3rd of June this nest contained four eggs, and as the day had passed without one being deposited, I concluded that the set was complete, so I took them, and they are now in my collection. On this occasion the mother bird was seated on the nest which she did not leave until I almost touched her with my hand, and then, instead of flying out, she ran mouse-like into a neighboring brush-pile, which I shook before she flushed to a stand a few yards off, when she uttered some notes and I had no doubt of her identity as a female mourning warbler. The ground color of these eggs is white, and the spotting more of a brownish hue, than either reddish, or black, and one of the set has its marking on the smaller end. The nest itself was rather bulky for the size of the bird. Underneath on the earth was a platform of dry weed stalks; then dry leaves, which had evidently been put together in a moist condition, formed the bottom and the sides of the nest; but the upper rim, and the inside was formed of fibers of vines and grasses, and there was some cattle-tail hair intermingled with the lining."

In 1871, Dr. A. M. Ross of Toronto, published a little work on "The Birds of Canada," which is remarkable as being the first treatise on this subject composed by a resident of Ontario. The following is what he wrote on the mourning warbler. "Its note is a little 'chit,' uttered in a soft, pensive tone; general color, ashy



gray above, and black underneath. Breeds in Canada, nest in a low bush; eggs four, bluish white."

In length, this species is between five and six inches. The plumage varies somewhat according to age, and season; but is generally on the upper parts of the body of a bright olive hue, with ashy on the head, below clear yellow, the throat and breast being black, the plumage of both sex is similar.

Listowel, Ontario, Canada.

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## ORNITHOLOGY.

### A WHITE PELICAN AT MANOTICK.

J. F. WHITEAVES.

The Museum of the Geological Survey has recently acquired a fine specimen of the American white pelican, *Pelecanus erythrorhynchus*, which was shot two miles south of Manotick, Ont., by Mr. John Flann, Jr., on the 25th of May last. When shot, it was on a log in the Rideau River. It is a fine adult female in full spring plumage, with the culmen or ridge of the upper mandible of its bill flattened, and entirely devoid of the high, thin, upright comb or crest that is so characteristic of the middle of that part of the bill of the male of this species during the breeding season. The bill was partly pale horn and partly pale flesh coloured, with an orange tip to the upper mandible and a yellow patch round each eye; the pouch was bright yellow, the iris of each eye hazel or dark brown (not white), and the legs and feet bright orange. On dissection, the flesh was found to be inflated everywhere by numerous large air cells, most of the eggs were no larger than a small shot, though a few were as large as peas, and the stomach contained six freshly caught yellow perch about three or four inches in length.

The American white pelican, which was first described by Gmelin in 1788, is an abundant summer resident in the prairie country of Manitoba and the North West Territories, where it breeds in colonies, but it is rare in British Columbia. In winter it is common in Florida, and its course of migration northward is said to be along the great inland rivers, for in summer it is es-

essentially an inland dweller. Macoun says that stragglers of this species are occasionally taken on Lake Ontario and others on Lake Erie, and Chamberlain that "one specimen has been taken in Nova Scotia and two in New Brunswick." But, so far as the writer is aware, this is the first record of its occurrence in the Ottawa valley. It was previously represented in the Survey collection by one specimen from Lake Winnipeg, shot by Mr. J. M. Macoun in 1884 and another from Crane Lake, Assa., shot by Mr. Sreadborough in 1896; by a series of its eggs, from a small island at the western end of Lake Winnipegosis, collected by Mr. J. B. Tyrrell in 1889; and by a large photograph of the nesting place of a colony, at Shoal Lake, Manitoba.

Two other species or varieties of pelican are of much rarer occurrence in Canada, and both of these are of an essentially marine habit.

One of these is the brown pelican, *Pelecanus fuscus*, which was first described by Linnæus in 1766, and which is common in the Southern Atlantic and Gulf States. During the last ten years at least three specimens of it have been shot in Nova Scotia, and one of these is in the Museum of the Survey.

The other is the Californian brown pelican, *Pelecanus Californicus*, two specimens of which, according to Mr. Fannin, have been shot on the coast of British Columbia. It was first described by Ridgway in 1884, and may be only a local variety of *Pelecanus fuscus*.

The "Pelican of the Wilderness," (Káath) of the Psalms, is the European white pelican, *Pelecanus onocrotalus*, the male of which has no crest to the upper mandible in the breeding season. This species spends the winter in Palestine and migrates to Russia in the summer. Under the Mosaic dispensation, the use of its flesh for food was forbidden to the Jews. A recent writer says of it that the operation of feeding its young is rendered easier by the parent pressing the pouch and lower mandible against the breast, and the contrast of the red hook of the bill with the white of the breast probably gave rise to the poetic idea of the ancients, that the female pelican nourished her young with her blood. From the earliest times the pelican has been the emblem of charity.

## MY BIRDS AND HOW THEY CAME TO ME.

It was my good fortune to spend the coldest week of this winter in a small New Hampshire town on the bank of the Connecticut River. The thermometer stood at 25° at breakfast time; the days were sunny, the air was still, and the moon at the full; all this with an unbroken level of fresh snow made winter a delight to one "who likes that kind of thing."

Sparrows were not to be seen at our end of the town, but chickadees, white-breasted nuthatches, pine grosbeaks and downy and hairy woodpeckers were more or less common visitors. A sheltered corner of the verandah had been wired in below by way of protection from cats and in this corner was a large wooden trough filled with dried sun-flowers, while suet hung from the trees and shrubs near by. To the sun-flowers came flocks of chickadees, with an occasional nuthatch, in and out the live-long day. I watched them with delight and came home to try my hand at feeding birds in Cambridge.

On the south side of the house stands a willow-tree whose long boughs reach out in all directions, making in summer a forest of green, where birds of various kinds find camping ground. There have been crows, robins, grackles, rose-breasted grosbeaks, pine grosbeaks, white-breasted nuthatches, chickadees, brown creepers, flickers, downy woodpeckers, humming birds, song sparrows, chipping sparrows, redstarts, cedar birds, vireos, summer yellowbirds, orioles, blue jays, golden-crowned kinglets, goldfinches, cuckoos, and once—A day to be remembered!—one of the maids came breathless to my door.

"Please, Miss, John wants you to look out of the window to see a bird."

"What is it, John?" I said.

"Well, it was the reddest bird I ever seen. I was watering the purple beech and he came and bathed in the pool; but now he's gone."

"Don't you think it was a robin?" I asked in exact imitation of my own Bird-man, who generally calls all my new birds English sparrows.

"Robin?" repeated John, "Well, no, it wasn't a robin. As if

I didn't know a robin!" muttered the exasperated observer; and sure enough, as I stood at the window, still thinking, "it was just a robin," suddenly there lighted on the willow bough almost within touch, "the reddest bird I ever seen."

"Do I look like a robin?" he asked.

"No, not in the least," I answered. "You beautiful scarlet tanager!"

All these birds have at various times perched on the willow-tree, but until this year I had never thought to feed as well as shelter the winter guests.

The first venture was in suet; cutting pieces as large as my fist and tying them to a long string I threw them from my bedroom window over the nearest willow bough fastening the string to the window-sill so that the suet was quite under control. At the end of a week the chickadees were literally in full swing.

I next bought a peck of sun-flower seeds and scattering them on a drawing-board I put the board on the window-ledge shutting down the sash to steady the board. In three days the chickadees were on the board. I then bought a plaster-cast of a hand and arm, filled the hand with seeds and put it on the window-ledge. The birds came to the hand. Finally I put out my own hand with seeds and in two minutes a chickadee was on my hand. No one who has not tried it can know the pleasure of feeling the little feet of a wild bird clinging to one's finger. Since then the chickadees have come to me every day, even flying about the room,—this, however, is accidental and not always agreeable to them; one however made himself quite at home, flew from one spot to another without dismay, and at last perched on the top of the door, and when I reached up my hand he hopped upon my finger and let me carry him to the window. A basket full of sun-flower seeds and chopped raw peanuts stands on the window-ledge and to this come the nuthatches as well as the chickadees; but they are not so tame and although one comes to me and flutters over my hand, its courage fails it at the last and it darts back to the willow bough and cries "yank, yank," until I draw back my hand, and then it flies to the basket and looks up in my face quite at its ease. A woodpecker has been at the basket; the kinglets poise under the suet, and once I saw a goldfinch hanging on it.

In February we had a small flock of pine grosbeaks feeding on the privet berries and on rotten apples thrown on the ground, a flicker also came every day for the apples. In trying to hang an apple on the willow bough for the grosbeak I miscalculated the length of the string, the apple fell short, rebounded and broke the dining-room window. The glass was mended, I tried again, and an apple hung oddly enough from a winter-bare willow bough, and I sat me down to wait for a grosbeak. In a few minutes a great gray squirrel ran up the tree and in clawing the apple he tipped it over the bough and it hit the window again: this time, however, without any castastrophe. Probably a squirrel cannot throw as hard as a woman. After that the apples lay on the ground, or rather on the snow, for until quite lately there has been no "ground" to be seen.

Now that the snow has almost gone and the birds are finding food elsewhere, they come less often to my window, but the pleasure of having had them will be a joy forever.

M. E.

Cambridge, Massachusetts,

March 22, 1904.

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#### SUB-EXCURSION TO BLUEBERRY POINT.

The Ottawa Field Naturalists' Club held its second sub-excursion for 1904 to Blueberry Point, Aylmer, on May 7th. About 150 persons were present, the Normal School and the Ottawa Ladies' College being well represented.

The Trailing Arbutus (*Epigaea repens*) was very abundant and eagerly collected. The banksian, red and white pines were observed and *Viola cardaminefolia* and *V. subviscosa*, collected in good condition.

At the close of the afternoon's work Dr. Sinclair assembled the party and called for addresses from the leaders present. Mr. W. J. Wilson illustrated by means of a map the geographical formation of the district, and gave some valuable hints to those commencing field work in geology. He pointed out that the unusually high water of the Ottawa River had covered all the shore

material and prevented his section from doing any work in the usual locality. Messrs. Gibson and Young reported the season a backward one, as they had taken very few species of insects. Two species of butterflies, the Spring Blue and the Early Native White were observed for the first time this year.

Rev. Dr. Blackader and Mr. Clarke spoke of the plants found. Dr. Macdonald, M.A., drew attention to the benefits to be derived from an outing with the Field Naturalists' Club, and expressed his appreciation of their work.

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#### BOTANICAL NOTES.

##### ALUM ROOT AS A REMEDY FOR DIARRHOEA.

An interesting note on the medicinal value of Alum-root, (*Heuchera hispida*, Pursh) has been sent in by Mr. W. McCarthy of Rat Portage, Ont., who writes: "I was out prospecting with two white men (Mr. Moore and Mr. Walters) and an Indian. The two former were taken sick with severe diarrhoea for three days. The Indian left camp and went to the bush and got some of the plant I send you. He gave each of the men about an inch of the root to chew and swallow the juice. It acted like magic and the next day they were quite recovered. I have since had some of the root pounded fine and put a little water on it and boiled it up with sugar. I then strained it and have given it to several infants for cholera infantum and it has proved successful. The plant is abundant here and I have given it to several who have also used it successfully." The closely allied *Heuchera Americana*, L., is known to be a powerful astringent.

J. FLETCHER.

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## NATURE STUDY—NO. XIV.

## SOME UNDERLYING PRINCIPLES, METHOD AND SYSTEM OF NATURE STUDY.

C. W. G. EIFRIG.

Most educators, and people of alert mind generally, have come to recognize the usefulness and even necessity of Nature Study for people in general and the young in particular. I hold that to study and know something about nature and the objects in it, among which we live, which we see, hear and are brought in more or less close proximity to, is as useful and profitable for a person as some of the branches of science and art hitherto taught in schools and colleges to the exclusion of everything else. For instance, if we learn at school, where a certain city or river is situated in the world, which we shall perhaps never see or even hear of again, it is just as valuable to know where certain trees and plants grow, especially in our neighborhood, and why, and where the different individuals or families of living things stay and where they do not as well as for what purpose. If we read in history of the irruptions of, say, the Huns into Europe and their defeat A.D. 453, or of the immigration of the Anglo-Saxons into Britain 449 A.D., etc., it is just as important and valuable for people to know about the irruption and migration, the appearance and disappearance of insects, birds, mammals, fishes, plants, etc., which may affect our lives favorably or unfavorably, destroy our crops or trees, or help us to overcome such pests, etc. If we derive endless pleasure by studying the gems of thought and diction in literature, why overlook the gems of God's own handiwork in His mineral, vegetable and animal kingdoms surrounding us! And these can be found and enjoyed not from dusty books, but out in the sweet-scented air and healthgiving sunshine. If a person not used to it, once tries to see and observe things in nature, he will soon find how little he is able to see and hear and differentiate correctly, how little he can use his senses properly, showing that while his head may be crammed full of book knowledge, his faculties to rightly observe things near him have been neglected, and he will perceive, that, though he knows a good deal about things far removed from him by space or time, he knows little or nothing

of things surrounding him, of which he perhaps makes daily use or could do so, and from which he might be able to derive enjoyment if he were able to understand, know or at least properly observe them. So, there can be no difference of opinion as to the usefulness and necessity of Nature Study. But, regarding the ways and means of it, there is as yet no concurrence of opinion. And it is the object of this paper to state some underlying principles for Nature Study as the writer conceives it, whether it is carried on professionally or in an amateur-like manner, and whether much or little time can be devoted to it.

In the first place, Nature Study must not be looked upon and taken up as a *fad*. Ours is eminently an age of fads. Faddism is carried into every branch of human activity. If one takes up Nature Study, or any other study, as a fad, as a passing whim of fashion, as an affectation of some people, he or she thereby debases such study, debauches the mind and intellect, and squanders time and money. No, it must be looked upon as a study requiring earnestness of purpose, all powers of mind and body while carried on, devotion and application to it, also patience and resourcefulness. Whoever does not want to undertake Nature Study in this way, had better not begin it at all, or at least not call his weak dabbling with science and nature or his more or less purposeless rambles, Nature Study.

As is necessary in most undertakings of men, a student of nature must not begin his work at random, in a purposeless and ever-shifting way, but there must be method and system in his work, be this much or little. To attempt to carry on Nature Study without this would be as foolish as trying to build a house without plan or fixed idea. As a few most necessary principles underlying the system and method of the study of nature, I would submit these, viz.: *Limitation, concentration, exactness*, and after all this, the making *accessible* to others of the results.

So, first, there is *limitation*, i. e. that a student of nature, professional or otherwise, confines himself to certain limited areas of investigation of objects offered us by nature. Life is too short, even for one who can give *all* his time to this, to take up all the fascinating problems that ask for solution in the realm of nature. So, if a lover of this study would plunge himself into it headlong,



try to begin everything, and follow all lines of investigation, he would soon be hopelessly stranded and become disgusted at the impossibility of his undertaking. One should rather take up a small area, the smaller the less his time is, and he may obtain gratifying results. If you cannot take up botany entire, or dendrology, or herpetology or ichthyology, etc., take up a small item in one or more of these, *e. g.* the study of mosses or lichens or mushrooms, or begin with a family of trees or birds or fishes or insects. There are few, even among the most common insects or birds or mammals, whose life history is entirely and completely known.

Furthermore there is *concentration*, in which must be included thoroughness and patience. One must concentrate his mind on the chosen study, and give it his best efforts. He must not be superficial but thorough in his observations. He must not jump at conclusions. That is extremely dangerous. Science does not want it, although many scientific men indulge in it. Science is derived from the Latin *scio*, to know; it must deal with *facts* only. So, painstaking, laborious investigation and observation is wanted, not half-observed phenomena and guesses. Sometimes an infinite amount of patience is required. Think of John Burroughs digging away two or three tons of earth in order to understand the ways of a weasel's underground home! Or Audubon, now in the far west, now in Labrador, now in the limitless forests of Kentucky or the impenetrable mangrove thickets of the gulf coast, in heat and cold, observing, sketching, recording. If a bird or insect with which one wishes to become acquainted flies into a thicket or swamp, it will not do to remain outside; it means to follow it up at the risk of ruffling one's clothes and temper.

Coupled with thoroughness must be *exactness*. A student may be thorough, not spare himself labor and exertion, and yet not be exact in getting at his results or recording them. If he sees a certain damage done to a plant by insects, and finds an insect on the plant, it would not do to assume that this is the author of the harm until he sees it at work. The same holds good in all other branches. One must have a sense of responsibility, feeling that by inexactness he may cause people to believe and circulate untruth, which would always be harmful, leaving aside the moral issue.

And last but not least, a conscientious, patient, systematic student of nature should consider it his duty to *make the results of his labors accessible* to others, to science in general. If a per-

son has found out one fact concerning any mineral, plant or animal, large or small, a fact not known before or disputed, and is certain of it, he contributes to the sum of human knowledge by having it printed in some suitable medium of communication between scientific men, or where they can find it. At least let him give his notes to some such person who is able to apply the fruit of his labors to wider usefulness.

Now, after reading this, some ardent lover of nature who thought of becoming an amateur student of it, may say to himself, well, this rules me out of Nature Study; I have neither the time, nor the money, nor the scientific attainments of the mind to carry it on in this wise. But hold on! The underlying principles here mentioned, namely limitation, concentration, exactness and the making the results of your observations accessible to others, does not necessarily require all one's time, or much money and great scientific knowledge. There are people who have contributed largely to the sum of human knowledge who were busy men and did not have much leisure time and remained in their occupation throughout their life, one, a fellow of the Linnaean Society, London, remaining a cobbler to the end of his days. Nor must you think that only startling discoveries are valuable to man. No, many little, but correct observations round out the sum total of human knowledge just as surely and effectually. And how many great discoveries etc., have been begun in a small way! Look at James Watt, pondering over the phenomenon of the escaping steam from the tea-kettle lifting up the lid. By following this up, he became the inventor of the steam engine. The lawn in front of your house may harbor an insect new to science. Novices in astronomy have discovered new stars. Tenacity of will-power counts for most here, whether one has little or much time. And even if you can not achieve any results satisfactory to yourself, you will at least get into closer touch with nature, your powers of the senses will be whetted, you will see and hear more beautiful things than people who have no eye or ear for them, though they live right amongst them. It is a thing of beauty and a joy forever to observe the ways of living things in field, woods and meadow; to see the wise adaptation of means to certain ends and to behold the beauty of design and finish in even the minutest specimens of God's handiwork in nature. And then, there is the healthfulness of it! Pure air and sunshine are by far the best preventive and curative medicines in the world. And while taking them in, it is better to have some object in view, to engage the mind somewhat, else it will soon become tedious. And that something ought then to be one of the fields of Nature Study, even though a much restricted one must be chosen.

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