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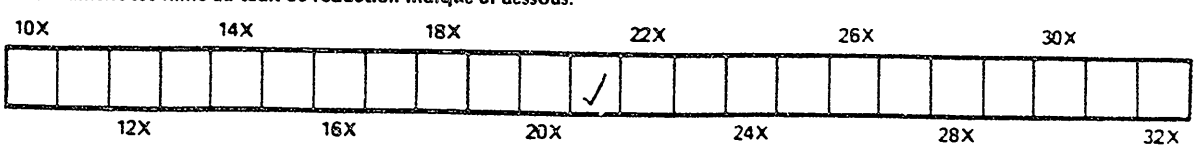

No. 7 | 1884. | Sept.

THE Canadian Science MONTHLY.

DEVOTED TO THE INTERESTS OF

Canadian Naturalists and designed to encourage the popular study of the Natural Sciences.

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A. J. PINEO, WOLFVILLE, N.S.

CONTENTS OF THIS NUMBER.

*Written for the MONTHLY.

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The Canadian Science Monthly.

VOL. II WOLFVILLE, N. S. SEPTEMBER, 1884. No. 7.

EDUCATION O TSIDE THE SCHOOL ROOM.

It was Edmund Burke that said "Education is the cheap defence of nations," and perhaps we cannot find any one who does not recognize the fact that education, in the broadest sense of the term, both in the common school and in the higher realm of culture, is essential to the maintenance of an advanced civilization and requisite to the intellectual and moral progress of the race. No thoughtful person can doubt the fact that the best arrangement of public affairs, the highest attainment of moral culture and the purest state of social life are dependent upon the throughness and universality of education. The beneficent Creator has bestowed on man mental and moral faculties. He has graciously endowed him with social qualities which may be trained to grand and noble purposes. Reason and revelation enjoin upon man the obligation to cultivate for noble uses these God-given powers. The capacity developed and the direction given to these is what is implied by the term education. But it is true that much the largest proportion of mental and moral training received by each member of society comes through exterior channels. Man is unconsciously educated by that which is daily transpiring around him. As the rocks and pebbles polish each other by contact in the flood, so men affect each other, and character is moulded by personal influence in the rushing tide of life. Coming within the circle of these ever operative forces, we see that the process of training that we call education goes forward much more rapidly out of school than under the care of the professor. Prominent among the agencies that make up the sum total of the educating forces is the social influence of the home. As a rule the life receives its outline and general direction before the pupil enters the public school. Education begins with life. The sense of touch first ministers to the infantile training; afterward the sight, then the hearing. The senses are the guides leading the van in the progress of nature. We necessarily begin with present and tangible things. Afterward we give absent things a visible form by pictures, and this, meeting the eye, is described and impresses the mind through the sense of hearing. Thus, before we are conscious that the child is affected by surroundings the foundations of character are formed.

"The real seed corn whence our republic sprung were the Christian house-

holds which stepped forth from the cabin of the Mayflower, or which set up the family altar of the Hollander and the Huguenot on Manhattan Island or in the sunny south." The best characters, the best legislation, the best institutions were cradled in such hope. Immediately in connection with the home, are other social influences that operate continuously as teachers. There are groups of children in the alleys and on the commons, the natural product of the saloons, a vicious and neglected element, being educated rapidly for evil. In a few years they will control the elections and re-enact the shameful scenes so recently perpetrated in Cincinnati.

The religious and secular press are agencies for great power, wielding a mightier influence on the public conscience and the character than the schools. The poet Browning says:

> On which the arm of progress leans,
> Man's noblest mission to advance,
> His woes assuage, his weal enhance,
> His rights enforce, his wrongs redress,
> Mightiest of mighty is the press."

How shall we speak of this enginery for good or evil, this resistless force that day and night moves on with ever increasing power, enlarging its sphere and intensifying its importance as an educator? Through the press religion, liberty and law are made effective in fitting men for noble deeds. But by the same agency, plagues worse than those that destroyed the land of the Pharaohs are diffused over society, poisoning the pure fountain of public and private virtue. Cowper says:

> "Thou fountain at which drink the good and wise,
> Thou ever bubbling spring of endless lies,
> Like Eden's dread probation tree,
> Knowledge of good and evil comes from thee."

War and commerce are educating forces, and although intimately related, each has its distinctive features. The varied lessons of war cannot be analyzed, the subtle influence cannot be measured; it is beyond the reach of all chemical solvents known to the world; it breaks up all existing forms of thought and compels society to take on new ideas and clothe itself in new attire. War does not always educate aright. When its power is sought for perpetuating despotism, for oppressing the toiling millions of earth it awakens no holy aspirations; it develops the lowest and darkest passion of the soul; it puts out the sight of home, and settles like the shadows of death upon the crushed and blighted sons of men. But when war is necessary for the purpose of guarding freedom's holy altars and defending the honor of home and preserving beneficent institutions for those who shall live in coming years, it takes on a brighter hue and its educational powers are exerted along other lines; if it inaugurates political convulsions, these, like geological upheavals, usher in new epochs in the world's history that indicate its rapid growth, for the public mind that is indifferent to the arguments of a statesman is educated quickly and thoroughly by the events that are the sequences of a defensive war.

So far as we can judge from the view we can get of the subject, the Divine mind contemplated this earth as the sphere of man's noblest activities, and in providing for his progress, for the discipline of his moral faculties and for his intellectual nature, He so constructed the earth that commerce should become a science, and, that while it should administer to man's physical wants, it should at the same time contribute to the adornment and development of his mental and moral being. In order that man might not fail of this, He distributed with a lavish hand the gold and silver in the crevices of the mountains. He set the sturdy oak and the pine in the Northern forests. He gave the cotton and the corn to the rich valleys of the South and West. He filled the caverns of the earth with coal and oil, and deposited the pearls and gems in the depth of the sea. So, that while in every land there are the staples and the luxuries, an exchange of commodities is a necessity, and while the American fills his home with the productions of foreign lands, the streets of the cities of ancient learning and wealth are lighted from the oil wells of his native land. The desire for wealth has always been a spur to human exertion and the possession of wealth has been and ever must be a source of power to the individual and the state. Gold is the sinews of war and the amount of gold possessed by any nation is the measure of its material value. Before the rise of commerce the only intercourse nations held with each other was that of warfare.

"There were then the only two sources of wealth, agriculture and pillage." "Cyrus led the Persian armies to the rich provinces of Asia for the express purpose of plunder." "The Romans who were then masters of the world arrogated to themselves all treasures." Having heard of the fabulous riches of one of the kings of Egypt, "they passed a law by which they constituted themselves the heirs of a living monarch and confiscated the dominion of an ally." Such was the state of the world when commerce began its career. It entered the arena as an educator, it laid its fashioning hand on every department of life, it transformed hostile nations into admiring and devoted friends and bound them together in their efforts to subdue the earth and make it yield up its treasures to the will of man. Although it did not abolish war, it showed the highway to the golden age by developing new industries and making attractive and possible the arts of peace. Commerce began to manifest its powers a thousand years before the Christian era. It originated among the Phœnicians and, although subjected to many adverse influences and suffering many reverses, it has steadily gained in extent, power and influence and at the present time it is in a great measure shaping the policy of all nations and projecting enterprises which cheer the hearts and brighten the homes of millions of the human race.

But there are two prime factors in the education of the masses, two agencies that in a larger and more general sense contribute to the education outside of the school room; the lecture platform and the pulpit. These are educating forces in the strictest sense of the term. The lecture platform of this age is a modification of the ancient forum. The orators of Rome and Greece were the educators of the people. But the form of society in which we live gives to the platform a wide range and more extended influence.

Committees on special subjects, boards of health, trustees of benevolent institutions, legislative bodies, and almost every conceivable variety of deliberative assemblies meet and discuss questions of commerce, education, social reform and political economy, and while this form of society remains, the lecture platform must always be an agency for the instruction of the people, voicing alike the grandest thought of the scientific man and the orator who directs the thought of the common citizen in the ordinary affairs of life. While the pulpit does not cover so wide a range of topics as the platform, is not possessed of the almost limitless variety, it is more forceful, in manner more definite and impressive than any other method of instruction. From the days when Ezra, the scribe, "stood upon a pulpit of wood and read the law" to the present time, the pulpit has been a definite and authoritative means of instruction. It is not an institution which may lose its influence in the lapse of years. Since the days of Jesus the forums of Greece and Rome have perished or have been superseded by the modern lecture platform, while the pulpit has multiplied itself and more nearly controls the public conscience than any single influence and perhaps excels all other agencies outside the schools.

But in this brief estimate of educating forces we cannot overlook the exalted and refining power of music and art nor reject their contributions to the culture, and happiness of the human race.

The meaning of song goes deep into the heart. No one can express in logical form the effect music has on man. It is a form of unfathomable speech warming the soul for heroic deeds. According to a fable, Orpheus was presented with a lyre by his father, who taught him to play upon it. He attained such a skill that nothing could withstand the charm of his music. Men and wild animals thronged round him entranced, the trees crowded about him and the rocks softened under the magic of his notes. His wife dying, he followed her into the realms of Pluto and there sang his woes so pathetically that the ghosts wept. Tantalus forgot his thirst, the fairies shed tears and Pluto consented to restore his lost wife.

However much of fancy there may be in this, music forms the universal language which, when all other tongues were confounded, was left unchanged amid the babbling multitude. All nations can sing together when they cannot understand each other so as to converse. Music is the inarticulate

speech of the heart, and cannot be compressed into words, because it is infinite. And this universal teacher teaches king and peasant, and puts its polishing hand upon the farmer's son and the statesman. It is our inspiration to patriotism, philanthropy and religion, an agent more effectual than the instruction of the professor, in shaping the character and destiny of nations and men.

Intimately related to music is art, a wonderful teacher; also a perpetual force in character building, an inspiration to the student to seek a more intimate acquaintance with his own powers. "Art is the enduring record of man's purest conceptions in tones universally and forever intelligible."

However broad the scholarship, art improves the taste, refines and polishes the manners, and gives the luster and brilliancy to all other attainments. Art establishes a holy communion between man and nature. Ruskin says: "Man is not a child of nature like a hare. That nature is worse to man than a stepmother, persecuting him to the death if he does not return to the realm of art where he belongs." The gallery of art runs back through the ages of the world's life, and has gathered the finest conceptions of the finite mind. Within the golden gates of this temple the canvas and the stone are full of vitality and intense with expression. Along the polished walls of this temple are hung the masterpieces of the great artists. Along its lengthened corridors architecture has inscribed her name and lent her loveliness for its pillar and canopy. In her gorgeous aisles the sculptured marble stands radiant with grace and beauty, and from the canvas and the stone the mind catches the divine outline, the fair ideal of a perfect life. The production of pencil, brush and chisel, frescoes, the carved work and painting of the ancient temple and modern gallery, are the silent teachers of the coming ages, the high ideals toward which each new generation aspires.—*Mrs. Dr. Jones, in Kansas City Review.*

THE BRITISH ASSOCIATION.

The British Association for the advancement of Science which was formed fifty-three years ago in England, by such men as Sir David Brewster, Sir Humphrey Davy and Sir John Herchel, has lately met for the first time outside of the charmed circle of the British Isles. The event is one of no small importance, whether it be regarded as a sign of the advancement in applied science which made such a migration possible, or a sign of the political importance of the New Dominion. The Canadians have evidently felt the compliment paid them by this great Scientific Association—the greatest of any country and of any age—and withal, one possessing presumably a great deal of that British element, conservatism. They have repaid the compliment generously and gracefully too, to judge from the kind words of their departing guests.

Eight or nine hundred British scientists came across the water,

and of these about the usual number, over seven hundred, were old members. So that the Association has been a success so far as the attendance of old British members is concerned, and in every other respect it has been more interesting and more successful than ever before. A large contingent of Canadians has been drawn into the Association, and to these must be added a large attendance of the eminent scientific men of the Republic.

The object of the Association, as its name implies, is the advancement of scientific research. Annually those who think they have made some new conquest in the regions of nature present their papers for discussion and criticism, and committees are appointed at the Association's expense to make investigations in directions in which important facts or generalizations appear to lie. Among the noted men with whose names we had already been familiar were the following, no more awe-inspiring in appearance than so many Canadians, and no less good natured and loveable. First, we must mention the President, the Right Hon. Lord Rayleigh, M A., D. C. L., F. R. S., F. R. A. S., F. R. G. S., Professor of Experimental Physics in the University of Cambridge; and among the Vice Presidents, the Right Hon. Sir Lyon Playfair, K. C. B., M. P., Ph. D., L. L. D., F. R. S. L. & E., F. C. S.; Prof. Edward Frankland, M. D., D.C. L.; Ph. D., F. R. S., F. C. S.; and the Canadians' Principal Sir William Dawson, C. M. G., M. A., L. L. D., F. R. S., F. G. S., and Thomas Sterry Hunt Esq., M. A., D. S., L. L. D., F. R. S. Of the eminet Presidents of former years, the genial Prof. Sir Wm. Thomson, M. A., L. L. D., D. C. L., F. R. S. L. & E., F. R. A. S. was present.

As nearly two thousand members of the Association were present, it is evident even to the uninitiated that subdivisions of this great whole into sections was necessary. On Wednesday evening the whole body met in the Queen's Hall, Montreal, to hear the President's address, which was a very able review of the advance of science in its several natural divisions during the past year.

But the regular work of the Association was done during the day in the section meeting. Of these sections there were eight, each meeting in its own rooms or building, and under its own officers and committees. These sections with a few of their best known officers were as follows:

Section A.—Mathematical and physical science—President, Sir William Thompson. The sections met for work on Aug. 28th and 29th. The 30th, Saturday, was devoted to excursions to Quebec, Ottawa, Lake Memphremagog and various other points of interest. Section resumed work again on Monday Sept. 1st, 2nd and one half of them on the 3rd. This section met on four days, but on the last day a sub-section was formed, in which no less than 19 papers were read. Total number of papers read in this section was 66.

Section B. — Chemical Science— President, Professor Sir Henry E. Roscoe. In this section 33 papers were read, with many interesting experiments, and some sharp discussion.

Section C.—Geology—President W. T. Blanford, F. R. S., F. R. G. S. In this section work was done on the 3rd Sept., all the papers read being 51. There were some lively discussions in this section also.

Section D. — Biology — President, H. N. Moseley, M. A., F. R. S., F.L.S., F. R. G. S., F. Z. S. Professor of Human and Comparative Anatomy, Oxford. A sub-section of Physiology had to be formed to get through the work of this section. 56 papers were read.

Section E.—Geography—President, General Sir J. W. Lefroy, C. B., K. C. M. G., F. R. S., F. S. A. 23 papers were read in this section.

Section F.—Economic Science and Statistics.—President, Sir R. Temple Bart, G. C. S., C. I. E., D. C. L., F. R. G. S. 38 papers were read consuming five days.

Section G.—Mechanical Science.—President, Sir F. I. Bramwell, F. R. S., V. P. Inst. C. E. 37 papers were read taking five days.

Section H.--Anthropology-President, —E. B. Tylor, D.C.L., L.L.D., F.R.S. 31 papers read, five days. Professor W. Boyd Dawkins one of the Vice-Presidents of the section was present.

Thus in the one week no less that 338 papers were read and many of them severely criticised or discussed. In the evenings popular lectures were given in Queen's Hall to the Association as a whole. The evening programme was as follows: Aug. 27th, President's address already alluded to; 28th, Soiree in the McGill University Buildings, luminous with electric lights, etc., etc., but crowded with a crushing throng; 29th, Prof. Dodge's lecture on Dust—splendid; Sept 1st, Dr. Dallinger's lecture on Lower forms of life–magnificent; 2nd, Soiree —Reception of Association by the City of Montreal in the Victoria Skating rink—brilliant. There were also other interesting popular lectures given by some emminent members of the Association, numerous public garden parties, excursions and such like.

To find any given member of the Association in the multitude would be no small task. Members first went to the reception room, where officers were placed for registering names and supplying every necessary information by book, circular, and printed reports or by oral communication. Then there was the Library and Redpath Museum open, and a large room nearly filled with tables and writing material, which was being constantly filled by over a score of writers at a time. There were also general post office rooms, travelling information etc., etc., and lunch tents on the grounds near by. In every section room was a bulletin board with two rows of eight bulletin leaves, the first row showing the papers being read in each section, and the second

showing the next paper to succeed in each section. These boards were kept in constant communication by the telephone, and with the printed programme for each day in one's hand, there was no difficulty in finding out when you should move to hear a favorite paper in some other section.

To attempt to give an outline of the work done can in an instant be seen to be impossible in any ordinary space. An outline even of each president's opening address would furnish material for several articles. What then of the 338 papers? Suffice it to say, at present, the oldest office bearers present say that the amount and character of the work were equal, if not superior to any previous meeting of the Association. The visitor is lost in the multiplicity of the work going on, and although he may see how "the thing is done" in each section, he can have no clearer idea of the general character of the whole work done, than the reader of the well filled dailies of Montreal in his rocking chair three thousand miles away.—A. H. McKAY.

Astronomy.

THE STARS

BY PROF. A. E. COLDWELL.

PAPER III. THE CONSTELLATIONS.

Corona Borealis—The Northern Crown.

Bootes—The Bear Driver.

Berenice's Hair.

In the centre of the western sky during the early part of October may be seen a group of stars making a semicircle the open part being toward the zenith. This is the Northern Crown. The whole constellation contains two stars, but only six are conspicuous and these form the semi-circle or crown. The centre one of these is much brighter than the others, being of the 2nd magnitude. It is named Alphacca. This is a very pretty and interesting group and when once recognized will never be forgotten.

Bootes is a large, straggling constellation, situated between *Corona Borealis* and *Ursa Major*. It contains 54 stars, but is chiefly noted for its one bright star *Arcturus*, of the 1st magnitude. This is a very conspicuous star of a reddish hue and shines with such brilliancy that it is often mistaken for a planet, especially when, as in the months of September and October, it is found in the Western heavens. Directions for finding Arcturus have been given before. It is a few degrees below a line formed through *Zeta* and *Eta* in *Ursa Major* or the two end stars in the handle of the Dipper. Arcturus has been known for a long time. Its earliest mention is in the book of Job.

Coma Berenices. This is a beautiful cluster of small stars situated a little to the west of Arcturus or on the right as the stars are seen in the autumn evenings. There are no conspicious stars in this group, the most of them ranging between the 4th and 5th magnitudes.

"There Berenice's locks first rose so bright
The heavens bespangling with dishevelled light."

WINTER NOTES ON ORNITHOLOGY

PAPER III.

By Prof. C. B. Wilson.

ORDER II. PICARIAE. A somewhat miscellaneous group, embracing the Kingfishers, Goatsuckers, Cuckoos, and the Woodpeckers. In these birds also the musical apparatus is a mere muscular mass, and none of them are in any degree singers. These points which distinguish them from the PASSERES, are that their wing-coverts are longer and more numerous. They all have ten primaries, and their second or fourth toe is versatile, i.e. it can be turned at will, either backward, thus making two in front and two behind, an arrangement very useful to the woodpeckers in climbing, or forward making three in front and one behind, a preferable arrangement for those of the order that perch. In some, however, the true hind toe (hallux) is wanting. Of the six families named in this order the first five are non-resident during the winter months. Indeed they each possess but one or two representatives and these are peculiarly migratory. Of the Kingfishers, our common Belted Kingfisher (Ceryle alcyon) is the sole representative, but to compensate for this he enjoys a very wide distribution over every portion of N. America from ocean to ocean and far into the ice and snow of the north. As an exception to the statement already made a few of these birds do linger over during our milder winters. Notwithstanding they are so widely distributed they are pre-eminently unsocial, being never found except in solitary pairs, and even in these the male and female keep apart as much as possible.

Among the Cuckoos, (Cuculidae) is found a very remarkable bird, only recently (1840) added to N. Amer. ornithology, the Chaparral Cock (Geococcyx californicus) which for swiftness of foot, though but little larger than a hen, is unequalled by any N. A. bird. It sometimes even escapes when hunted with horse and hounds. The Yellow and Black-billed Cuckoos are our only two representatives (Coccyzus americanus, and erythrophthalmus).

The Goatsuckers (Caprimulgidae) furnish two very characteristic species, the nighthawk (chordeiles popetue) and the whip-poor-will (caprimulgus vociferus). These birds are crepuscular in their habits and are only seen during our long summer eveningswhen flying about in search of their insect food.

The Swifts (Cypselidae) are such swallow like birds that they are often still associated with the true swallows from whom, however, they differ in very many essentials of structure. The old idea of relationship is still perpetuated in the name of our commonest swift, the 'Chimney Swallow,' which is not only no swallow, but even finds its nearest relative among the Hummingbirds.

These Humming-birds (Trochilidae) are at once the smallest, the most gorgeously beautiful, the most interesting, and well-nigh the most abundant of any single family of birds; but this abundance is one of species, there being 400

in all, and not of individuals. We in the north have only one species, the Ruby Throat(Trochilus colubris)which leaves us at the faintest indication of cold weather.

In distinction from these five families, the sixth, the Woodpeckers(picidae),are abundant in our winter bird life. There are five or six resident with us during the entire year, among which the smallest but most prominent is the diminutive Downy Woodpecker(Picus pubescens), commonly but erroneously called the little'Sapsucker.' He never sucked any sap in his whole history, and probably never will: he is readily recognized by his small size and by the two white, and two black stripes on the side of his head, the white ones meeting on the nape of the neck behind, where, in the male, the feathers are terminated with red. Indeed this red is so common on all the woodpeckers that the appellation"red headed woodpecker" is hardly more significant than "feathered owl" would be.

The Downy Woodpecker breeds about the middle of July. Selecting a suitable place in some orchard tree, often quite near a dwelling, the male bird cuts a hole into the tree as perfectly circular as if described with a compass. He is then relieved by the female, and both in turn push the work with indefatigable vigor. The cavity of the nest extends downward at an angle of 40 deg. for 8 inches or more, then straight down about a foot, enlarging toward the bottom. A few chips are left at the bottom on which are the 6 white eggs, which, like all woodpecker's eggs are nearly spherical in shape, and have a glassy surface.

During the entire season,but more especially until the young are able to care for themselves, both parents are constantly employed in searching for insects; these they seek in the orchard and its immediate vicinity. They have a partiality for old apple trees and any one who will take the trouble to examine an old tree in the first orchard he comes to, can hardly fail to find row on row of tiny holes made for this purpose by the Downy Woodpecker. This fact has created an unjust predjudice against him; unjust because he is a benefit, not an injury to the trees.

"Here then," says an eminent ornithologist who has taken great pains to thoroughly investigate this matter, " is a whole species of birds, which Providence seems to have formed for the protection of our fruit and forest trees from the ravages of vermin; which every day destroy millions of those noxious insects that would otherwise blast the hopes of the husbandman, and even promote the fertility of the tree, and in return are proscribed by those who ought to have been their protectors."

Beside the orchard trees the Downy Woodpecker seeks its food principally from the maple, elm, and ash, or,where it is too cold for these trees, from the aspen and birch. These are all valuable shade trees, the pride of our lawns and forests, and well deserve such an

efficient protector.

Beside the Downy Woodpecker, we have as winter residents, the Hairy Woodpecker(Picus villosus), the Log Cock, the largest of our Woodpeckers (Hylotomus pileatus) and the so called "Red Headed Woodpecker" (Melanerpes erythrocephalus).

ORDER III. RAPTORES, or Birds of Prey.

These are mostly of large size and powerful frame ;the bill is hooked and furnished at the base of the upper mandible with a soft waxy membrane (the *cere)* in which the nostrils are situated: the claws are long and powerful, the legs and thighs very robust, and the wings long and pointed so as to produce that peculiar mode of flight called soaring, characteristic of this order.

In short they are so exactly adapted to the carnivorous habits which they all possess, that one need not be told that they are strong destroyers, and because most men admire strength and power we call such birds noble If the truth were known, their nobility would be found to consist chiefly in an untiring care and love for their little ones, neither asking pity, nor granting it to others.

They readily separate into three well marked divisions ,Owls, Hawks, and Vultures, —the Felidae, Canidae, and Hyaenidae of Bird life. And here as in actual Cats, Dogs, and Hyenas, it is the latter, the carrion feeders of warm climates, that are liked the least, but are, in reality, the most useful and harmless, ridding the country of offal and carrion, that wou'd otherwise prove a most fertile source of deadly disease and pestilence.

It is the lordly Eagle, soaring aloft to the rocky pinnacle whereon his eyrie is built that becomes the symbol of American Freedom, but the vulture is just as grand in his flight and far more useful, though an exceedingly repulsive bird in appearance. The Owls (*Strigidae*) like the Cats (*Felidae*) are specially fitted to follow their prey by night, as Hawks, and Dogs do by day. Gliding stealthily amid the dusk and silence of night, guided by wide open eye and ear, they pounce noiselessly upon the unwary mouse or the sleeping bird. Then sharp claws appear from under the downy feet and clutch the smallest prey with needle like precision, and away goes the destroyer so quietly that the other animals, however near by, are in no way alarmed, nor are they even aware of his presence ,but remain in ignorant security till he comes to strike again. Not so do the Eagle and the dexterous Falcon hunt their prey, but, hovering aloft in the clear light of open day, they suddenly dash downward with a rushing noise, and seize their terrified victim as it frantically endeavors to escape.

Of the Vultures the Red-headed Vulture, or Turkey Buzzard is the only one that visits Canada. This bird has a very wide distribution, occuring as it does from Saskatchewan on the North thro' the entire breadth of the continents of North and South America to the Straits of Magellan on the south. On the Atlantic coast, however, it is rare north of New Jersey.

CANADIAN BIRDS.

By Ernest E. T. Seton.

PAPER III.

In paper 1, we took up the classification of birds, according to Prof. Coues, and although no more than the barest outlines were drawn, we will not follow it further, as our purpose will be best suited by proceeding at once, to take up, family by family, the natural history of the first Order—The Passeres.

The Order, PASSERES, is composed of twenty families of Birds, so far as Canada is concerned, of which the Turdidæ or Thrushes are usually accorded the first place as being the most highly organized. The following are the Canadian Turdidæ —

The Robin—*Turdus migratorius.*
The Wood Thrush—*mustelinus.*
The Hermit Thrush—*pallasii.*
The Olive-backed Thrush—*swainsoni.*
The Veery—*fuscescens.*
The Catbird—*Mimus carolinensis.*
The Thrasher — *Harporhynchus rufus*

All of these are abundant thoughout Eastern N. America.

The student should first familiarize himself with the general shape of a Robin's bill and legs, for these represent the typical form, and hereafter he is safe to pronounce a thrush any bird that has its bill and legs similar; that is with bill rather long and slender and slightly notched near the tip of the upper mandible, a few stiff bristles at the gape, nostrils oval and not hidden by the feathers, toes deeply cleft, legs or tarsi of a good size and booted, that is, covered with one long scale.

The Catbird, does not perfectly answer to this description, for its tarsus is scutellate, that is, covered by several plates or scales, and its tail is longer than that of the true Thrushes, therefore it is separated into the genus *mimus.*

The Thrasher differs still more, for besides having scutellate tarsi, its bill is without the notch, therefore it is separated still further and represents the genus *Harporhynchus.*

Before proceeding to take up each species separately it is well to explain certain signs which are used by scientists. The following are the few we shall use :

♂ = Male ; ♀ = Female ; O = Young; L = Length. All measurements will be given in inches and decimals of an inch. No doubt the metric system would be preferable, but at present it is hardly available for popular use.

The Robin, *Turdus Migritorius* (*Turdus* Latin for a thrush, *migratorius* migratory.) L. 9½. Above olive-gray, head and tail blackish, throat white with a few black spots, breast reddish chestnut, vent white. ♀ duller. Nest of fibrous roots and mud, mostly saddled on a large limb ; eggs, 3 to 5, in size 1.17 × .8, spotless blue-green. When young the Robin's breast is spotted like that of the other Thrushes ; this is understood to indicate their de-

scent from a common recent ancestor.

The Wood Thrush, *T. Mustelinus* (*mustelinus* = weasel colored.) L. 8. Below, white with dark spots on breast. *Reddish brown on the head, shaded through cinnamon on the back into olive on the tail.*

Nest of fibres and mud, on a low limb in the woods.

Eggs 4—5; .95 × .65; pale blue-green, said to be spotted occasionally.

A glorious songster,—the horn of elf-land itself.

The Hermit Thrush—*T. pallasi* (after Pallas the naturalist) L. 7.; colored somewhat like the last, but *all above olive brown* deepening into *reddish on the tail.*

Nest, of fibrous roots and grass, on a low limb or even on the ground.

Eggs, very like last, perhaps a little smaller. Even the Wood thrush's strains yield place to this the noblest voice of the forest.

The Olive-backed Thrush—*T. swainsoni* (after Swainson the naturalist) L. 7. Differs most tangibly from last in being *uniform olive above.*

Nest, of fibrous leaves etc., in a low tree or bush.

Eggs, 4 — 5; .9 × .62; blue green, speckled with brown.

A northerly species, whose history is still rather obscure.

The Veery—*T. fuscescens* (*fuscescens* = tawny.)

L. 7½. Differs chiefly in having breast but faintly spotted, and *upper parts uniform tawny.*

Nest, of leaves and roots, on or near the ground.

Eggs, 4 — 5; .95 × .65; bluish-green, spotless.

Probably the most abundant of the Wood Thrushes.

Known also as the Tawny Thrush, and Wilson's Thrush.

The Catbird—*Mimus Carolinensis* (*M* = a mimic, C = of Carolina). L 8¾. All over dark, slatey, but crissum chestnut and crown and tail black. Tail long and rounded.

Nest of fibres and twigs, in a low dense bush.

Eggs, 4 — 6; .95 × .7. Spotless, dark blue-green.

An abundant bird noted for its fine song, plagiarization and the gem-like beauty of its eggs. The famed mocking-bird is a near relative of the catbird.

The Thrasher—*Harporhynchus rufus* (*harpe* = a sickle, *rhynchus* = bill, *rufus* = red.)

L. 11. Sandy-red above, below white thickly spotted with black. Nest, in a low thicket, built of dry grass, strips of bark and twigs; eggs 4—5; 1.0 × .75 pale greenish, thickly freckled all over with brown.

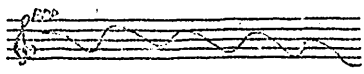
This is the long-tailed, copper-colored bird that is seen flitting from copse to copse in the half open woods. He is famed for his song. In some parts called the French mocking bird and Brown Thrush.

Having concluded the briefest possible description of each of the species, it would be in accordance with my plan to give a full biography of the type,

but in this ease, the type, the Robin, is so well known, that I will take instead, the Veery, the commonest of the four which are knnwn as Woodthrushes. It is not easy to give a full biography of such a shy bird but it is to be hoped that what is said will add to the interest felt in it.

About the last week of May the Veery comes home again to the Assiniboine Valley. Not in flocks like the Robins or with a loud announcement like the Meadow Larks and Cranes, but some morning he is found in possession of the same old brake, where last year he sang so well, but now he is silent, or at best uttering that peculiar single note which is declared by its *timbre* alone, to be the utterance of the same throat as that which will pour forth the sweet silvery notes we all love so well. In a few days the love fire is kindled, and the Veery begins to trill his song in the copse. Early in June, with his chosen mate, he begins to build in the thicket of alder or red willow, on the ground among the damp leaves, under the Solomon's Seals. "That is best which lieth nearest," so the nest is built of the fibrous roots and bark strips, which are strewn about on every side, for not only are they convenient, but they also serve as a concealment. The nest is a large mass of leaves and bark, with a comparatively small hollow in the middle, to contain eggs of so bright a hue, that it seems impossible to conceal them, contrasted as they are with dark surroundings. But on the other hand the color of the sitting bird so exactly harmonizes with that of the dead leaves about, that you are not likely to see the nest, unless your attention is drawn to it by the old bird flitting off with the most mournful chirps, that her rich voice can utter. Down among the dense shades of alder, where the creek is thinking aloud, where all is shady, unseen ever by the sun, where the dew lingers till noon, is Veery's home. "By cool Amiska's shady rill, how sweet the Veery sings." Loving the twilight his haunt is where there is twilight at noon; there in the cool green shadow, with dense alder above, and dense herbs of poison below is trilled the soft simple song of the Thrush of Wilson, the singer of the shady brook, as the Rosignol is of the sunlit. The loud Robin *cheers*, the wild Thrasher *fires*, but the gentle Veery soft and sad, *lulls*, with his sweet, pensive strains. He is no master of music, he is only part of the brook,—where it slides over some brown log, and as it turns at the bottom, white in the light, but speckled with pebbles, here where it sings in little sharps and trebles, it lives in the bird,—our Minnehaha, the rippling laugh of limpid water,—his is the same song, but in it is the spirit of a living being—the breath of life,—a high, trilling whistle, rich and clear, with a rippling cadence like the brook,—sweet as the sound of a spring tinkling into a pitcher,—he trills again and again, till listening you love the Brook-bird, and always after are his friend.

Some idea of the mere notes may be gathered from this stave :



If the modulation of this music may be shown by any such vulgarization as uncouth syllables, it may be compared to "*veery veery veery*," whence no doubt the bird was named. Yet neither bar nor words can at all make you know this sweetest of strains, "as simple as the curve in form and delighting from the pure element of harmony and beauty it contains and not from any novel or fantastical modulation of it.* You must hear it where it belongs. As well might you try to understand the sound of the crag-sounding Alphorn, by hearing the mere notes, wearily rendered in-doors, as to know the Veery's song away from its place. No! You must hear it in its home, for it is a sound that belongs to the dim, golden light of the underwood, a silver tongue in golden silence, a sound that is kin to the smell of sassafras, the hue of the Solomon's Seal, and the hazy glamours of dense leafage with the sun behind, a sound to recall the golden age gone by—boyhood. Yet even now hearing it, I can listen, and forget, and remember "till I beget that golden time again," hear it, mingling as of old with the water's voice, and Veery as with knowledge, calls, and calls, calling till the man is forgotten and tears come up, "*weary weary weary*," and the water, "Come be a boy once more."

For years I have heard the Veery and for long I have collected birds, but never yet looked on or touched the body of the sweet singer. A dozen times the tinkler has been in line with my gunsights, but he was allowed to fly in peace.

A good naturalist wrote 'that they abound in the copse, for he could hear them singing all round.' A farm boy said to me, 'what bird is it that sings all around you in the bush, and you can't tell where it is?' The boy was right, it was doubtless one bird, (not *many* in the copse) that uttered the changing note. I have generally found that like its brethren, the Veery is fond of solitude.

But for long I was deceived; many a time while listening to the falling water note of our Minnehaha, sometimes by my side and sometimes afar off and changing in all ways, I have thought, "how numerous they are here!" But no! Like some other birds the Veery has power "to throw its voice," as I found out very lately. I stood by a caged Veery; the spring whistling of Robins, or the spring itself moved his genius of song and he trilled the old woodland notes with open mouth; then the bill closed and a far away soft response came again and again, sometimes from one side and sometimes from another. There was no other Veery, and it was only after watching the softly vibrating throat, that I knew that the same bird uttered all the notes.

Where the Veery sings, there grows a slender lily. Dig out its root and you will see thereon, marks as of a seal,

*John Burroughs.

from these it is named the Solomon's Seal. I have always connected this with the Veery by a sort of fantasy that is not entirely uninteresting or baseless, for it always springs up, when the bird comes, and blooms when he begins to sing; so that it is pleasant to think of them together, for this surely is among flowers, what the bird is among its kind. "Simple as the curve" is the Veery's song, a simple curve is this slender lily. Veery's life blooms into his silver note, and the life-aim of the lily is furnished in the simple silver frilled bloom on its brow; born together in the shade their graceful lives are side by side, till last, when the summer wanes, the Veery flies away and the lily dies.

Mineralogy.

By Prof. S. K. Hitchings.

No. IV.

APATITE.

This mineral is a phosphate of lime. It occurs in six-sided prisms which are usually short, possessing imperfect cleavage across the crystal. Sometimes occurs massive, globular and reniform.

The usual color is green of various shades, but blue, yellow and reddish are sometimes seen. Lustre vitreous to resinous; hardness 5; quite brittle. With the blowpipe it may be fused with difficulty on thin edges, the flame being colored reddish-yellow by the lime. If wet with sulphuric acid before heating it will color the flame bluish-green, showing the presence of phosphoric acid. Dissolves in nitric and hydrochloric acids. Apatite occurs most commonly in metamorphic rocks such as granular limestone, gneiss and granite. When found abundantly it is used in making superphosphate, which is used as a fertilizer.

TALC

occurs usually in foliated masses; also granular or compact, rarely in rhombic or hexagonal crystals. Color, light green, grayish or white. It yields readily to the finger nails, its hardness being but 1. Splits easily into thin laminae, which are flexible, but not elastic, having a pearly lustre. With the blowpipe it is infusible. Moistened with cobalt nitrate it gives on heating, a pink color; not acted on by acids; in closed tube yields water. In composition it is a silicate of magnesia.

Steatite or Soapstone is a grayish massive or granular variety, which is very greasy to the touch. It takes a high polish and as it stands heat well, is used in making stoves, etc. *French Chalk* is a massive milk-white variety.

SERPENTINE.

This is usually found in granular or impalpable masses of a green color, varying in shade; sometimes found in delicate fibrous masses. The lustre is slight, being inclined to waxy, sometimes translucent, but usually opaque; hardness 2.5—4; feels slightly greasy; fuses with difficulty on the edges; gives water in closed tube. Its composition is similar to talc but it yields

more water and less silica. Serpentine often occurs mixed with limestone in a beautifully mottled way forming a fine ornamental stone known as *verd antique*, much used for mantles, etc.

BOTANICAL RAMBLE ON THE PLAINS OF LAKE HURON.

"I will meet you on Monday, Sept. 8th, at 10 o'clock at the place you named." H. S.

The above was what I received in reply to a message sent to my friend Mr. S. of Sarnia, to set a day on which to meet at the house of Mr. W., a mutual friend, an enthusiastic lover of flowers, and a good horticulturist, cultivating a fine fruit farm on the plains.

As the weather had been very dry and warm for some time previous, a light shower on the evening of the 7th was doubly welcome, cooling the air and laying the dust, making the prospect for the morrow's promised ramble more enjoyable than it would otherwise have been.

The appointed morning broke cool and dull, a heavy mist obscuring the sun's rays, which generally is an indication of a clear unclouded sky after ten o'clock. I was astir early, and not long in getting ready the articles required for digging and gathering plants, and was soon on the road, drive to the appointed place. On my way I pass the Vyner cheese factory where several men, each with a wagon loaded with milk cans, are busy unloading the milk, soon to be converted into cheese, gathered from a territory ten miles long by five broad; then through a settlement two and a half miles in length and bearing what now seems to those who see it for the first time, the very inappropriate name of Frog Town. This spot forms a practical example of what rapid strides farming is making in our land. This tract of land was held by a firm, and not put on the market until the surrounding country was all settled and cleared up, thus raising the the price of this wild land. Twenty one years ago it was offered for sale at ten dollars per acre, and not very rapidly sold, owing to its being a heavy elm and ash swamp, which for weeks in the spring and also in wet summers was covered almost entirely with water, to a depth of from six to eighteen inches; it was then given the name it now bears, which, although the cause is removed, will cling to it for all time. The land once settled owing to the surrounding country being well cleared, and the receiving of help from the council in drainage, the water was quickly removed, and with great results. Just nineteen years ago I, as a small boy, went for the first time the same road I am now on, then a mere track through the woods, wide enough for a yoke of oxen and wagon; now we are surrounded on all sides by smiling cultivated farms which bring quickly from forty to fifty-five dollars per acre.

Near the centre of the settlement I pass the school house, erected as soon as the number of the inhabitants gave them the requisite financial strength to do so.

A strong fire is raging in the swamp below this, which, unless checked by timely rains, will destroy much valuable timber—a large block of White Cedar(*Thuga Occidentalis*).

Off the main road, on to a side road, bordered by a heavy piece of timber, with a dense undergrowth of bushes, shrubs and climbing plants, among which are conspicuous great clumps of the high bush cranberry(*Viburnum Opulas*)with its clusters of rich red fruit, masses of nightshade with its crimson and black berries, and wild Grape vines climbing high over tree and bush, their long tender shoots drooping gracefully, and swaying to and fro in the breeze, and breaking the somewhat stern and unbending look of the large forest trees. Some large plants of the Virgin's Bower(*Clematis Virginiana*)with its shining green leaves and pretty clusters of small white flowers, catching my eye, I stop my horse, and trowel in hand, wade the ditch through water half way to the top of my long boots, and secure a couple of good strong roots to take home for planting. Emerging from the woods I cross a marsh about a mile in width, before reaching the high land bordering the lake shore. This marsh stretches away a mile to the west where it merges into Lake Wawanash of which more anon. The most of this marsh is a wild tangle of bushes and shrubs, reeds and wild grasses; while wild Asters, in all gradations of white, blue and purple, combined with enormous quantities of very large Golden Rod (*Solidago*) stretch far as color is discernable to the eye in the dull morning, flanked on one side by the woods I have just come through, which seems to form a solid wall of green, and on the other, osier like bushes, the bright red bark of which shows them at once to be the Red Osier Dodwood (*Cosnus Stolonera*). Great clumps of these bushes also spangle the whole marsh around. The ditch and fence are almost hidden from view by asters, golden rods and wild roses now out of bloom, and a few dogwoods, with a fine lot of fruit just turning blue, but with a species with which I was unfamiliar. This mile forms a drive of wondrous beauty, and a few weeks earlier, when the roses are in bloom—wasting their sweetness, on the desert air, it stands unrivaled in this part of the country.

By the time the shore is reached the mist begins to lift and let the sun's rays glimmer through. A light breeze stirs the blue waters of Lake Huron into a gentle ripple, on which the straggling sunbeams dance and flash merrily, while farther out, seemingly unobscured by the mist hanging over the shore, they glitter brightly. A number of vessels are seen far out speeding onward to their destination, their white sails glittering in the morning sun and shining like pearls on a ground work of solid blue. I can just discern for a few minutes a dark line which is the pine covered shores of Michigan twenty miles off. Behind me, to the east, on our own shore, blue points can be plainly seen, while farther away in the same direction Kettle points stands boldly out in view.

Two and a half miles more, one of which is along the edge of the lake, brings me to Mr. W—'s ten minutes before the time agreed upon. Within the last twenty minutes the mist has entirely cleared away, leaving a clear unclouded sky, making the day all that could be desired for a holiday.

After stabling my horse I repair to the house where I am cordially welcomed by Mrs. W. Mr. S. having arrived all things are now favorable for a botanical ramble on the plains and their surroundings which I shall describe in my next.

JOHN MORRISON JR.

Oban, Ontario.

GEOLOGICAL EXCURSION

WITH SCIENTISTS OF THE BRITISH ASSOCIATION.

I have just had a pleasant trip with members of the British Association. We met at Amherst on Saturday morning, Sept. 20th. Our party of observation consisted of Dr. Blanford, President of the Geological Section, and Mr. Velley of University College, Oxford, a member of the Chemical Section, Hon. Mr. Fielding, Mr. Pipes, M.P.P., Mr. Gilpin, manager of the Spring Hill Mines, Professor Lawson, Mr. Lay, Principal of Amherst Academy, J. Albert Black of the *Amherst Gazette*, Mr. Scott of the *Evening Mail*, Mr. Harris of the *Morning Chronicle*, and myself. We proceeded first of all to the South Joggins. The mines were inspected and the middle Carboniferous section of the shore pretty thoroughly examined in descending order, (geologically). We returned then to Maccan and proceeded to Spring Hill. Here we passed the Sabbath. On Monday morning I examined sections of undisturbed drift near the mines. Our party in the forenoon examined the extensive works and mines under the guidance of Messrs. Leckie & Hall. In the afternoon we went by the Spring Hill and Parrsboro Railway, and carriage, to Partridge Island. We noted the sequence of formations and compared it with that of the map of Acadian Geology. Next morning I re-examined the formations from Parrsboro to Partridge Island. I had thus an opportunity of making a section from Springhill to Partridge Island. In the afternoon we sailed from Partridge Island to Windsor. The day was beautiful and the atmosphere very clear so that we could distinguish and mark the sections of formations all around at Blomidon, from it to Grand Pre, and of the estuary of the Avon. We examined the exposures of marly gypsum and fossiliferous lime-stones above the old Avon Bridge. Here Dr. Blanford particularly observed the structure of amygdaloid and other trappean boulders from Blomidon and Partridge Island; also of syenites, diorites, &c. from the drift of the Cobequids through which he had passed on the Spring Hill and Parrsboro Railway.

We were then taken to the marvellous exposures of Gypsum in the magnificent quarries near Newport.

In the night we proceeded to Halifax.

Next morning our party was largely increased by the addition of Geologists, Agriculturists and others under the guidance of Major Gen. Laurie, who had been prevented from joining us at Amherst, in consequence of an accident in the Rocky Mountains.

In the forenoon we went to the Montague gold mines and examined with interest the work going on: First the operations at the crushing mill, second, the mining of the Bluenose lead; third the operations of the concentrating mill for concentrating the tailings of the crushing mill, with a view to the recovery of the waste gold retained by the Arsenopyite. In the afternoon the Geologists of the party went to Point Pleasant. Here were observed and admired the marvellous operations of the old glaciers in rubbing furrowing, and striating the rocks; also in the transportation of boulders from the Cobequid mountains, Partridge Island and Blomidon, with other material from the Triassic sandstone, the Carboniferous formations of Hants County and the Lower Cambrian rocks of the gold fields. One immense boulder at the bottom of a drift section was especially noticed. This was marked deeply and singularly so that no one could doubt that it had been part of the great ploughshare that had furrowed the rocks. Among other boulders one was particularly attended to. This had been extracted from the drift not long before by Prof. Richards and others from the Mass. Technological Institute Dr. Blanford at once recognized it as a boulder from Partridge Island such as he had seen at the Avon Bridge. It was a beautiful amygdaloid boulder of good size replete with amygdules of zeolites. Mr. Toplay, reporter of the Geological section of the British Association collected specimens of these boulders and took notes.

D. HONEYMAN.

FERTILIZATION OF FLOWERS.

G. U. HAY, St. John, N. B.

PAPER II.

In a previous paper I have endeavored to show by a few well-known examples that cross-fertilization is effected in plants largely by insect agency; that this cross-fertilization, or the fertilizing of the ovules of one angiosperm by the pollen from a separate plant of the same species, is necessary, generally speaking, to the production of healthy plants; and that the higher order of phanerogams are provided with colors and sweet juices to allure those insects that are best suited for the purpose of pollination. In this second and last paper on this subject I shall refer to other means than those before mentioned to secure cross-fertilization, pointing out only some well-known instances, with the hope that those who are just entering on the study of Botany may be induced not only to secure and read for themselves some of the interesting

literature on this subject, but best of all, that they may observe for themselves, and furnish evidence in establishing new facts on a subject that may be regarded more in its infancy than any other in phanerogamic botany. I hope that the MONTHLY will be made more and more the medium for recording the results of *original* investigation among our naturalists, on this as well as on other subjects.

Self-fertilization—that is for the pollen to fertilize the ovules of the same flower—does not seem to be the intention of nature, although it may appear to the ordinary observer, to be the obvious method. Indeed, until recent years it seems not to have occured to botanists but that the stamens and pistils which stand side by side in the same flower were intended to reproduce another plant independent of any outside agency. In a work on Botany that I have before me, published less than forty years ago, the subject of fertilization by insects or other agency is not even hinted at. Now it is a well recognized fact that various and often astonishing means are adopted to prevent self-fertilization in plants when stamens and pistils are very near together. In many cases where these organs are close together they mature at different times, the anthers come to perfection and discharge their pollen before the ovules of the same flower are ready to receive it, or *vice versa*. But in every field we find early and late flowers of the same species. In such cases the wind or insect agency is indespensible to secure fertilization, carrying the pollen, it may be from mature anthers to another plant where the stigma of the pistil is ready to receive it, but on which the stamen has become mature perhaps several days before and has shed its pollen. In *Plantago major* the pistil matures before the stamens, and its ovules, therefore, can only be fertilized by pollen from a *later* flower. In many grasses the anthers discharge their pollen at one time, but the pistils are not ready to receive this pollen till hours afterward. In both these cases the flowers are not bright or conspicuous, but they shed an abundance of pollen which is carried by the wind and retained in the atmosphere(often to an injurious extent)until it is ready to fertilize the ovules of another flower when ready to be matured.

Another arrangement to secure cross-fertilization, more especially by insect agency, is that called dimorphism. This, as its name implies, is a double form of flower in the same species of plant, but double only in reference to the relative length of stamens and pistil.It can be explained by a familiar example. Quite common in the lower counties of New Brunswick is the pretty spring plant, *Houstonia cerulea*, or Bluet, springing from dry meadows or hill-sides about the last of May. It grows in dense patches and I have often transferred a sod containing one of these patches to the house where it has continued in bloom for days and even weeks after,—its

salver-shaped corolla of violet blue with a yellow eye in the centre, being an object of constant delight. But the attentive observer will notice that the eye varies, sometimes being made up of four anthers closely huddled together, and less frequently of two diverging stigmas. In the first case, if the tube of the corrolla be slit lengthwise and laid open it will be seen that there is a short style and that the double stigma is considerably below the anthers. In the second case it will be observed that the anthers have very short filaments, and that the style, bearing on its top the forked stigmas, projects to the top of the corolla and perhaps a little beyond. At first sight one might be tempted to regard one form of such flowers as a "sport". But a closer observation has convinced botanists that there is a design in this double form. Let me quote Dr. Gray's interesting description as to what takes place: "Small insects, feeding by a proboscis, passing from flower to flower, take from the high stamened one some pollen upon the face, as it is brought down close to the orifice of the corolla when the proboscis is thrust to the bottom for the nectar there. When the insect passes to another flower of the same sort, it merely gets its face smeared with a little more pollen. But when it visits a long-styled flower, and brings its head down to the orifice it will apply some of this pollen to the stigmas, which are exactly in the position to receive it. So the high anthers are to fertilize the high stigmas. How about the low stamens and low stigmas, when the insect flies from a flower of the second sort to one of the first, as it is quite as likely to do? Why, the insect's proboscis, as it explores the flower, gets dusted with the pollen of the low anthers, and the pollen is neatly carried and applied to the similarly placed stigmas of the other kind of flower."

There are many other instances of dimorphous plants, and there are very many plans that nature takes to effect this cross fertilization. Nearly every flower so fertilized takes its own peculiar method to perpetuate itself. Concerning these methods much is daily being added to our knowledge by close and intelligent observation; and nature will only yield up her secrets to the diligent and earnest watcher. Every intelligent worker in science thus has it in his power to add something to the world's knowledge.

NOVA SCOTIAN GEOLOGY.

PAPER III.

By Rev. D. Honeyman, D. C. L., F. R. S. C.

The following are rocks collected at Arisaig and Cobequid Mountains in Nova Scotia and in Drift, as well as at Boisdale and elsewhere in Cape Breton. I also give a list of the minerals which enter into the constitution of the rocks, and accidental minerals.

Rocks.	Minerals.
Granites.	*Molybdenite.*
Syenites.	*Calchopyrite.*
Gneisses.	*Pyrite.*
Diorites.	*Calcite.*

Amphibolite.
Ophite
Crystalline Limestone,
Ophicalcite.
Quartzites.
Felsites.

Quartz
Hornblende or [Amphibolite.
Muscovite
Albite (Soda Feldspar.)
Microcline (Green Feldspar.)
Orthoclase. (Potash Feldspar.)

OBSERVATIONS ON ROCKS.

GRANITES.

Several varieties of Granite occur in the Cobequid Mountains. Boulders in the drift at Thrum Cap show that one of these is hornblende granite. Its constituent minerals are quartz, reddish feldspar, black mica, and hornblende. Its feldspar sometimes makes it porphyrite being disposed in seperate crystals. Granite boulders occurring with other Cobequid mountain boulders near West River Station of Pictou Railway are not distinguishable from Halifax Granites. In the northern "Archæan" series of Cape Breton the Granites are coarse, and have been characterized as Gneisses.

SYENITES.

Those having *two* constituent minerals, Feldspar and Hornblende, occur in the Cobequid Mountains.

Quartz syenites, having quartz as a third constituent, occur plentifully in Arisaig and the Cobequid Mountains and in the Halifax Harbor drift as well as in Cape Breton. In some of these the feldspar is red, often bright red, the quartz brown and the hornblende only enough to make it a syenite. Boulders of the Cobequid syenites are plentifully associated with the Blomidon and Partridge Island amygdaloids and basalts, beside the fossiliferous limestones above the old Avon Bridge and in the Halifax Harbor drift.

GNEISSES.

The archæan gneisses of Nova Scotia are syenitic or hornblendic. Their constituents are feldspar and hornblende in irregular banded form. Grains of magnetite often form bands instead of or along with hornblende.

DIORITES are composed of a triclinic feldspar and hornblende.

The feldspar of the archæan diorites is albite (soda feldspar) These are generally granitoid and contain magnetite. The Arisaig diorites found *in situ* have this mineral. Boulders from the Cobequid Mountains found in the Halifax Harbor drift are still more magnetitic.

AMPHIBOLITE.

This rock is found at Arisaig. It is composed chiefly of the mineral hornblende or amphibolite. I distinguish the rocks from the minerals of the same name, according to Dana's mode, e. g. Amphibolyte the rock, Amphibolite the mineral. In the same way, Magnetyte and Magnetite.

OPHITE.

Another name is Serpentine. We designate the rock by the one term and the mineral of which the rock is composed by the other. This rock is found in the Arisaig and George River, C.B., series.

CRYSTALLINE LIMESTONE. Also called Marbles. These are found at Arisaig, at George River, C. B., and Five Islands in the Cobequids.

OPHICALCITES—Ophiolites —Serpentines. All these terms are applied to the same kind of rock. We prefer the first as it characterizes the rock. It is a compound of Ophite and Calcite, a crystalline limestone. These are found at Arisaig and George River.

QUARTZITES. I give this name to dark colored stratified rocks, which are hard as flint. These are permeated by quartz veins which contain mica. They occur in typical series.

FELSITES are feldspathic rocks—bedded—which cannot be included in any of the preceding groups.

OBSERVATIONS ON MINERALS.

MOLYBDENITE, occurs in the Archæan rocks of Gabarus C. B.

CALCHOPYRITE, Copper ore, is found at Gabarus and Coxheath, C. B.

PYRITE, is of frequent occurence, e. g. George River C. B. associated with the Ophites.

MAGNETITE. Its mode of occurrence has been noted in the Arisaig diorites, and in the Cobequid mountain gneisses and diorites.

CALCITE, is found as an accidental mineral in syenite and diorite veins at Arisaig. This is a constituent of limestone and ophicalcites.

QUARTZ, is found in veins in diorites at Arisaig and as a constituent of granites, syenites and quartzites.

HORNBLENDE, is found as a mineral in Arisaig diorites, and is a constituent of granitoid diorites, syenites, amphibolyte and hornblende granite.

MUSCOVITE, is a species of mica which is a constituent of granite. It also occurs as a mineral in the quartzite veins of Arisaig. In Cape Breton it occurs in a manner which may be called accidental, i.e. in plates of an unusual size.

ALBITE, is a Soda Feldspar. It is triclinic. It is a constituent of diorites. In the Arisaig rocks it is found in cavities of diorites in crystals.

MICROCLINE, is a green feldspar that occurs as an accidental mineral in the red syenites of Arisaig. It is sometimes called Amazon stone.

ORTHOCLASE, is a potash feldspar. It is a common constituent of granites syenites, gneisses and felsites.

PLANETS STUDIED BY THE AID OF THE MICROSCOPE.

BY PROF. EMILE BONNET.

(Translation.)

A new field of study has been recently opened in astronomical science. The microscope, hitherto employed for the study of bodies infinitely small, is going to enable us to make known the details of the constitution of the

stars, those enormous masses which roll through space. The application of the microscope to astronomy is due to two French savants, Messrs Drago and Boquet de la Grege. These two astronomers having been in Mexico studying the last transit of Venus, which occurred Dec. 6th, 1882, took several instantaneous photographs of that planet. Since their return to France they have studied with much care, with the aid of the microscope the impressions thus obtained, and they have succeeded in perceiving the details of the surface and outline of this star with great exactness. As this exactness is far superior to what has been obtained thus far in the description of the configuration of the earth itself, it has been proposed to make an application of this new method to the study of our globe.

To achieve this result a very ingenious means is employed. By taking advantage of the movement when an eclipse of the moon occurrs, the shadow of the earth on that body is photographed. A large number of copies is made and these are studied with the microscope thus securing an accuracy of outline otherwise unattainable.

Whatever may be the results of this new method of furthering astronomical science we cannot but admire the ingenuity of its inventors.

Cette, France. Aug. 30th, 1884.

Courage comes from application
Of a heart that does not shirk,
And whose sweetest consolation
Is upheld by steadfast work.

Joel Benton.

THE PREVENTION OF HYDROPHOBIA BY INOCULATION.

BY J. EMILE BONNET.

(Translated by Madame Bauer.)

The CANADIAN SCIENCE MONTHLY has already made known to its readers the researches of M. Pasteur on hydrophobia. Some time ago this savant asked the French Government for an appointment of a Commission to examine and verify his investigations. This Commission being appointed, Mr. Pasteur laid before it his first series of experiments on dogs. The following is the result of these experiments, according to the official statement rendered by the Commission :

Every dog that Mr. Pasteur had declared mad, thanks to the treatment he made them undergo, has survived the tests of inoculation, which have been made with the most powerful virus and by treatments acknowledged as most severe, while most of the dogs which have been subjected to the same tests without having been previously inoculated, were not able to survive them and have died of hydrophobia.

Mr. Pasteur has begun before the Commission other experiments relative to duration of the immunity procured by inoculation and for the prevention of human hydrophobia.

Let us hope that these last experiments will give as happy results as those already obtained, and that medical science will soon be in possession of a preventive against that terrible disease, hydrophobia.

Cette, France.

Canadian Science Monthly.

Devoted to the interests of Canadian Naturalists and to the encouragement of the more general study of the Natural Sciences.

A. J. PINEO, EDITOR.

WOLFVILLE - - - - NOVA SCOTIA

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Editorial Notes.

We hope all our readers are sufficiently large-hearted and forgiving to overlook the delay in the publication of the MONTHLY. The fitting up of a printing office from which is issued, besides the MONTHLY, a large weekly newspaper and a college journal, has been a matter more engrossing in its details than we anticipated. We are, however, bringing order out of confusion, and hope to soon overtake our work. We expect to issue the October number in November, and the November and December numbers during the latter month, so that from the beginning of our next volume we shall be able to issue promptly before the middle of each month.

The collecting season is nearly over and our naturalist friends will soon begin to turn up their note books. We hope that they will give their fellow-workers, through the columns of the MONTHLY. the benefit of their summer's study in nature's open field. Let there be a general and generous exchange of notes.

We had the pleasure of visiting the Provincial Museum the other day where we found our venerable friend, Dr. Honeyman, in the midst of his labors. Despite his silvered locks the Dr. still retains the vigor and enthusiasm of earlier years that led him to explore, in his geological tours, the remote and wilderness portions of our Province.

His careful observations and scientific deductions in the department of Geology have given him a world wide recognition as authority on his favorite science, as they have done much to enlarge our knowledge of the geological formations of our Province. The Doctor is now engaged in the microscopic and polariscopic examinations of the rocks of Nova Scotia, the results of which he is giving in his series of papers in the MONTHLY.

Professor F. H. Eaton, of Truro, N. S., Director of the Department of Natural Philosophy, requests those students of the C. P. C. who are now taking that study to correspond with him.

NEWS AND NOTES.

Experiments in Lake Geneva show that delicate plants are influenced by light to a depth of 250 metres.

The *Journal of Botany*, XXII 108, states that W. B. Hensley points out that our *Sisyrinchium* is not *S. Bermudiana* of Linnæus which is much larger in all its parts and especially so in its broad leaves equitant at the base. Our species he refers to is *S. Angustifolium*, Miller.

A live tortoise was found in a solid cake of ice at Cornwall, Orange County, N. Y., recently. It measures eight inches in length and five in width, and was carefully cut out and taken to Mr. Clark's home, where, after it had lain in the sun a few hours, it began to show signs of life. It is now looked upon as a great curiosity, as the ice was gathered last winter, and the turtle was apparently none the worse for its congealed abiding-place.—*N. Y. Sun.*

In the July number of the *Torrey Bulletin* are found descriptions of ten new species of fungi by J. B. Ellis and Benj. M. Euerhart. Four of these are Canadian, having been collected by Prof. John Macoun, of the Dominion Geological Survey. They are named as follows: *Æcidium Ligustici* on *Ligusticum Scoticum*, Anticosti; *Nectria Canadensis*, on bark of Elm limbs, Ottawa; *Bosellina Macouniana*, on rotten wood, Ottawa; and *Nummularia Pezizoides*, on bark, Ottawa.

The Great Northern Shrike a Scavenger.

On the 24th of April, 1884, Mr. Napoleon A. Comeau shot three Butcher Birds *(Lanius borealis)* which were engaged in feeding upon the carcases of seals at Point de Monts, on the north shore of the entrance of the Gulf of St. Lawrence. C. HART MERRIAM.

The Labrador Duck, Camptolaemus Labradorius, long a rare Bird in the Gulf of St. Lawrence.]

The following note is of interest as bearing upon the length of time that the Labrador Duck has been a rare species, even along the north shore of the Gulf of St. Lawrence.

Mr. Napoleon A. Comeau wrote me, under date of February, 1882, that his father had mentioned as something unusual that he shot a Labrador Duck about twenty years previously, when he resided at Mingan.

C. HART MERRIAM.

Prof. H. N. Mosely, of England President of the Biographical Section of the British Association at Montreal exhibited specimens of *Utricularia vulgarisi*, holding in its embrace a number of young fish which it had caught. The taste of this plant is omnivorous. Of late Mr. Simms, of Oxford, placed 150 perch fry in a vessel containing specimens of the plant, and at the end of two days found that all except one or two had been entrapped.

Kalmia. Dr. Somers. of Halifax read a paper before the "Institute of Science" in Halifax, supporting the hypothesis that the poisoning reported from the eating of spruce partridge in

early winter may proceed from the poison of the leaves of *Kalmia* which are eaten by the partridge. He experienced the symptoms of poisoning himself, and maintains that his symptoms were those of Kalmia poisoning. The crops of partridges should always be examined, to discover the nature of their food, and also at the same time the cause of reported poisonings.

INSTITUTE OF NATURAL SCIENCE.

will meet in the Provincial Museum, Halifax, on Monday, the 10th inst., at 8 p. m. To be read:—1 "Report of Martin Murphy, C. E., delegate to the Royal Society of Canada." 2. "Retrospect of the Institute's Proceeding from its commencement.—By Wm. Gossip. ALEX McKAY,

Secretary.

New light is slowly dawning upon the important matters of plant physiology and chemistry. It now appears that plants have a new function which is affected by certain cells acting as a ferment, and producing nitric acid as the result of their action. We have long known that cells of fruits play the part of yeast in developing alcoholic fermentation, but it is new to learn that nitric acid is formed in plants through a similar agency. It is probable that the nitrates are universal in the vegetable kingdom, and that the stem is the principal seat of their production.—*Popular Science News.*

A large amount of brush was burned one night in the vicinity of Providence, which attracted birds from a swampy piece of woods near by. The birds are reported as flying into the flames in considerable numbers. Some were also attracted by the lights in the windows close by, and flew at the windows and some being opened, a few birds entered and were caught. Five were brought to us the next day, four of which were alive, viz, one scarlet tanager and three Connecticut warblers one of the latter having the adult plumage. The dead bird was a Maryland yellow-throat. — *Random Notes on Natural History.*

Cicuta Maculata. Not long ago we noticed the poisoning of a number of boys in Kentucky, U. S. A., by the eating of the root of the *Wild Hemlock* or *Wild Parsnip*, as it is called. On Saturday, Oct. 18th, Mr. Archibald Stuart, proprietor of the hotel at Porter's Lake, Halifax Co. N. S., was fatally poisoned by eating some of these roots, which he had mistaken for Sarsaparilla. A boy, Murphy, who was with him, was also poisoned but recovered after a prompt emetic. He did not eat so much of the root, as Mr. Stuart, who stood the action of the poison but for a short time. The plant is *Cicuta Maculata*, of the umbel-bearing family, and bears a resemblance to the parsnip, after which it is named and to the family of which it belongs. A few years ago a fatal case of poisoning from this plant was reported from Cumberland Co. N. S.

METEOROLOGICAL OBSERVATIONS RECORDED AT WOLFVILLE—AN AVERAGE OF 10 YEARS.

By Prof. D. F. Higgins, Ph. D.

	Max.	Mim.	Av. Max.	Av. Mim	Av. Mean	Av. Rain
January.....	61.0	—15.0	—4.86	45.50	23.05	4.08
February.....	59.5	—12.0	—3.28	50.69	24.51	3.83
March.....	60.0	—5.0	6.83	54.84	29 7.	3.06
April.....	69.2	10.0	21.90	65.30	39.75	2.75
May.....	83.0	26.1	32.02	77.27	50.81	3.69
June.....	94.0	36.2	41.56	82.77	61.10	3.74
July.....	89.2	46.0	50.32	85.66	66.50	3.95
August.....	87.3	44.5	48.22	83.21	65.30	3.51
September...	82.2	35.0	39.04	78.74	58.55	4.20
October.....	81.0	23.0	25.99	71.56	48.30	3.99
November...	68	15.0	20.23	63.52	39.15	4.53
December..	62.8	—6.7	1.61	50.76	26.75	4.08

THE LARGEST DREDGER.

The largest dredging machine in the world has been finished at Protrero Point, and will be used on the Sacramento and San Joaquin swamp lands. She has been named Thor, and modeled after the best dredges now in use by De Lesseps on the Isthmus Canal, cutting out a channel and building a levee at the same time. The Thor is 100 feet long and 61 feet wide, and has 34 iron buckets, with a capacity of 1½ cubic yards each, which can be filled and emptied fourteen times per minute. All the machinery was manufactured in San Francisco, and the timber is of Oregon pine.

A PERILOUS PATHWAY.

The travels of the native East Indian explorers, their stratagems and their frequent hair-breadth escapes, are teeming with excitement. One of them describes a portion of his track at the back of Mount Everest, as carried for a third of a mile along the face of a precipice at a heigth of 1,500 feet above the Bhotia-kosi River, upon iron pegs let into the face of the rock and slabs of stone stretching from peg to peg, in no place more than 18 inches, and often not more that 9 inches wide. Nevertheless this path is constantly used by men carrying burdens.

One of the finest feats of mountaineering on record was performed last year by Mr. W. W. Graham, who reached an elevation of 23,500 feet in the Himalayas, about 2,900 feet above the summit of Chimborazo. Mr. Graham was accompanied by an officer of the Swiss guide, an experienced mountaineer, and by a professional Swiss guide. They ascended Kabru, a mountain visible from Darjeeling, lying to the west of Kunchinjunga, whose summit still defies the strength of man.—*Scientific American.*

Apatite in Agriculture.—A paper on this subject was read and discussed at the Montreal meeting of the British Association. Apatite is a mineral of considerable economic value as a source of phosphoric acid and phosphorus, and has been sought after as a useful constituent of fertilizers, from the amount of phosphate of lime

which it contains. Of late years, however, the extensive developement of the South Carolina phosphate and marl trade has diminished the inquiry for apatite. It is more plentiful in the provinces of Ontario and Quebec than it is in the United States, Canada having shipped to Europe in 1882 over 17,000 tons, in addition to 5,000 tons sent to the New Jersey State Agricultural Experiment Station. It commonly occurs with metamorphose crystaline rocks, and in connection with metalliferous veins; though it is sometimes found in rocks of later geologic periods and occasionally in large masses. The chief localities in the United States have been in Massachussets, at Crown Point, (N. Y.,) where it was at one time extensively mined, and also in New Jersey, associated with iron-ore. Under these conditions, however, it has proved useless for agricultural purposes.—*Popular Science News.*

A DESTROYER IN THE SPRUCE FORESTS OF MAINE.

According to accounts of observations published in the third *Bulletin* of the Entomological Division of the Department of Agriculture, the ravages of the spruce bug worm *(Tortrix fumiferani)* have been extensive and destructive in the coast forests of Maine west of the Penobscot River. The damage appears to have reached only a few miles inland from the coast, but the belt in which it has prevailed is marked by extensive masses of dead woods. The trees are attacked in the terminal buds, which are eaten away, and when this is done the case is hopeless. The fatal character of the attack is owing to the fact that the spruce puts forth but few buds, and those mostly at the end of the twigs, and, when these are destroyed, it has nothing on which to sustain the season's life. The attack is made in June, when the growth is most lively, and just at the time when the check upon it can produce the most serious results. The larches are also attacked by a saw fly, but with results that are not as neccessarily fatal as in the case of the spruce. They are more liberally provided with buds, some of which may escape and afford a living provision of foliage. The larch, moreover, sheds its leaves in the fall, and is in full foliage before its enemies attack it. Hence, while the spruce and fir succumb to the first season's assault, the larch can endure two years of them.—*Science Monthly.*

SHELL-FISH AS FOOD.

Europeans are more given to the use of shell-fish as food than we Yankees, partly, no doubt, as a matter of economy. An English journal says: "The question of the value of shell-fish as food is not destitute of importance, from their large daily consumption. The oyster contains as large a percentage of nitrogenous or flesh-forming matter as an egg, each having about fourteen per cent, while the mussel follows close upon the oyster in this respect. Even compared with lean beef, the comparison is by no means unfavorable, the latter having only

five per cent more of the nitrogenous matter, and two per cent more of fat than the oyster. Different opinions have prevailed as to their digestibility; but, with the provisio that there are certain stomachs which altogether reject them, they do not appear to offer more than the average opposition to the action of the digestive organs. In this matter, however, much depends, as in most other foods, on the manner of cooking. However digestible and nutritious shell-fish may be as a rule, it is an undoubted fact that their use is occasionally followed by deleterious effects. Among the many thousands of species of shell-fish there are only two or three known or believed to be poisonous. Of the edible remainder, comparatively few kinds, however, are eaten. Of the shell-fish of commerce, the oyster is more important than all the others put together. Mussels, though largely used as food, are still more important as bait. Cockles, so far as we know, are the only other marine shell-fish cultivated by man. Large numbers are sold as food in towns near coasts where they are found, but they do not appear to bear conveyance to distant markets. In this respect they differ from the periwinkle, which can be carried from one end of the kingdom to the other without danger of spoiling. The trade in these mollusks is very large. It is stated that the supply of periwinkles brought to London averages about two thousand bushels per week from March to August, and about five hundred bushels weekly for the remaining months.

Literary Notices.

THE CHILDHOOD OF THE WORLD.

By EDWARD CLODD. No. 60 of the "Humboldt Library of Science." Price 15 cents, postpaid.

"The Childhood of the World" is a simple, lucid account of the origin and developement of civilization, tracing the rise and progress of governmental institutions, religion, manners and customs, arts and sciences, from the earliest periods of the history of man upon the earth, in the light of modern scientific research. The fruits of the labors of Taylor, Lubbock, Max Muller, and other great scholars are presented in a form so attractive as to command the attention even of the most listless reader.

For sale at this office, and sent on receipt of price.

WHEN the tide is at its height it turns. Our educational methods have been growing in system and severity, if not in perfection, for many years; and the demands upon the pupil have constantly increased, until the necessities for grading have become imperative, and the peculiarities of the individual are almost entirely ignored. It would seem to be impossible to carry this further, and any change now must be in some other direction. At this crisis one of the brightest and most fearless of American writers comes forward with a strong argument against the whole system, a protest against the grading and cramming that takes so much of the vitality out of the education we are giving to the rising generation. Edward Everett Hale, in the November number of the "North American Review," makes a plea for "Half Time in Schools", which every teacher and every school board ought to consider seriously. The other articles in this number are: "The African Problem," by Prof. Gilliam, 'Woman as a Political Factor," by Judge Robert C. Pitman; "Progress in Naval armament," by Hobart Pasha, who thinks the

United States Government has been wise in not constructing a costly navy; "Friendship in Ancient Poetry," by Principal J. G. Sharp; "Herbert Spencer's Latest Critic," by Prof. E. L. Youmans; "Over-Illustration," by Charles T. Congdon; and "Restriction of the Suffrage," by William L. Scruggs.

Correspondence

In our opinion a correspondence department would be an exceedingly interesting feature in the MONTHLY. In this questions could be propounded and answers given with a large degree of liberty and familiarity. Brief discussions also on points of scientific interest could be conducted to the interest and profit of our readers. The MONTHLY reaches a large number of practical observers and students of nature. Is there not in the mind of each one some vexed question on which he would like to learn the experience of others? One of our local subscribers opens this department with the following:

"Having just read an interesting article in an English paper on Truffles, I am curious to know whether or not this peculiar growth is found in America. Perhaps some of the botanical readers of the MONTHLY can enlighten me," E. N. P.

In the new geological map of the Dominion of Canada which has been put into the hands of the Geologists of the British Association by Dr. Selwyn, the typical Arisaig series is not indicated on account of the smallness of the scale. The Cobequid series and the several series in Cape Breton are distinguished by the synonymn "Pre-Cambrian."

In the map of Acadian geology they are often indicated, e. g. the Cobequid series as "igneous", and part—Upper Silurian—"Devonian." In the Northern part of Cape Breton, Upper Silurian."

It is proper that the different opinions held by Geologists on all controverted questions should be indicated as I purpose to do in my series of papers. D. HONEYMAN.

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