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Hamilton Association

FOR SESSION OF 1895-96.

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1896.

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ABSTRACT OF MINUTES

OF THE PROCEEDINGS OF THE

Hamilton Association

DURING THE

SESSION OF 1895-96.

THURSDAY, NOVEMBER 7th, 1895.

OPENING MEETING.

The meeting was called to order by the late President, Mr. Briggs, who at once introduced to the members the newly elected President, Mr. A. T. Neill.

The newly elected President then delivered his inaugural address, in which he outlined the sphere and duties of the Association.

At the conclusion of the President's address, Mr. Geo. Black explained and illustrated the properties of the newly discovered ascetylene gas.

Following the custom of previous years, the President then gave over the meeting to the chairmen of the various sections for the purpose of displaying the work of each.

Through the kindness of Prof. Aldous a short programme of music was rendered.

THURSDAY, DECEMBER, 5th, 1895.

The President, A. T. Neill, in the chair.

Minutes of the last regular meeting were read and confirmed.

Applications for membership were received from George McGorman, M. D., F. F. MacPherson, B. A., and Wm. C. Herriman, M. D.

The Recording Secretary, S. A. Morgan, B. A., was then introduced to read the paper of the evening, entitled "China, Past and Future."

In his paper the lecturer endeavored to set forth the great national ideals which give solidarity to the Chinese nation and from these to draw some conclusions as to the probable future of these remarkable people.

An interesting discussion followed the reading of the paper

THURSDAY, JANUARY 16th, 1896.

President A. T. Neill in the chair.

The minutes of the last regular meeting were read and confirmed

George McGorman, M. D., F. F. MacPherson, B. A., and Wm. C. Herriman, M. D., were elected ordinary members of the Association.

Applications for membership were received from Messrs. A. Mullin, T. O. Baldwin, W. C. Thompson, W. Kerruish and W. H. Johnson.

The President then introduced to the Association Mr. Archibald Blue, of the Bureau of Mines, who read a paper entitled "The New Ontario."

The paper treated in a clear and exhaustive manner of the geography, history and natural resources of this portion of our vast Dominion.

The lecturer closed his paper with an earnest wish that men and means would soon be forthcoming for the development of this portion of our heritage.

The thanks of the Association were tendered Mr Blue for his instructive paper.

THURSDAY, FEBRUARY 6th, 1896.

President Neill in the chair.

Minutes of the former meeting were read and confirmed.

The Corresponding Secretary reported the receipt of a number of exchanges.

The Curator reported the receipt from Washington of a number of fossils of the Miocene period.

Messrs. A. Mullin, T. O. Baldwin, W. C. Thompson, W. Kerruish and W. H. Johnson were elected ordinary members of the Association.

The Corresponding Secretary then read the two papers of the evening.

The first was from the pen of Mr. Wm. Yates, of Hatchley, and contained a series of notes on Biological matters.

The second, which was written by Mr. H. B. Small, of Ottawa, treated of nature study as a means of relieving the strain imposed by the conditions of modern civilization.

The papers were much enjoyed by the members and a spirited discussion followed.

THURSDAY, MARCH 5th, 1896.

The President in the chair.

Minutes of former meeting were read and confirmed.

The Corresponding Secretary reported the receipt of a number of exchanges.

The First Vice-President, T. W. Reynolds, M.D., was then introduced to read the paper of the evening, entitled "Neglected Methods of Education."

Defects in both home and school education were indicated by the lecturer and practical remedies suggested. The lecture was listened to with great attention, and an interesting discussion followed.

THURSDAY, APRIL 2nd, 1896.

The President, A. T. Neill, in the chair.

The minutes of the previous meeting were read and approved.

The Corresponding Secretary reported the receipt of a number of exchanges, and the Curator a number of contributions to the Museum.

Mr. A. Alexander, F. S. S., then read a valuable paper on "Local Museums."

The paper outlined the original purpose of a local museum, next giving the modern conception of such an institution as an integral part of the national educational system, and closed by sug-

gesting a number of necessary reforms in our own Museum to bring it up to this modern conception.

An animated discussion followed.

THURSDAY, MAY 7th, 1896.

The President, A.T. Neill, in the chair.

Minutes of the previous meeting were read and confirmed.

Mr. H. B. Small, of Ottawa, was appointed to represent the Association at the approaching meeting of the Royal Society.

Papers were read as follows:

"Biological Notes," by Mr. Wm. Yates, Hatchley, and "Our Educational System," by Inspector J. H. Smith.

Both papers contained much valuable and interesting information.

The annual meeting was then held, and the following reports read:

Report of the Council, by the Secretary.
" " " Corresponding Secretary, by Rev. J. H. Long, M. A., LL. B.
" " " Treasurer, by J. M. Burns.
" " " Curator, by Alex. Gaviller.
" " " Geological Section, by A. T. Neill.
" " " Biological Section, by A. Alexander.
" " " Photographic Section, by J. M. Eastwood.

The following officers were elected for the ensuing year:

President,	A. T. Neill.
First Vice-President,	T. W. Reynolds, M. D.
Second Vice-President,	A. E. Walker.
Corresponding Secretary,	Rev. J. H. Long, M.A., LL. B.
Recording Secretary,	S. A. Morgan, B. A.
Treasurer,	P. L. Scriven.
Curator,	Alex. Gaviller.
Asst. Curator,	H. S. Moore.
Auditors,	H. P. Bonney and F. Hansel.

Council: J. E. P. Aldous, B. A.; W. H. Elliott, B. A., Ph. B.; Thomas Morris, Jr., George Black and J. M. Burns.

REPORT OF THE COUNCIL.

Read at the Annual Meeting, May, 7th, 1896.

Your Council take pleasure in submitting the following report for the season of 1895-6.

The Council has held seven meetings since its last annual report, the proceedings of which have been duly recorded.

Seven meetings of the General Association have been held, at which the following papers were read and discussed :

1895.

Nov. 7th.—"Inaugural Address," President A. T. Neill.
Nov. 7th.—"Acetylene Gas," George Black.
Dec. 5th.—"China, Past and Future," S. A. Morgan, B. A.

1896.

Jan. 16th.—"The New Ontario," Archibald Blue.
Feb. 6th.—"Biological Notes," William Yates.
Feb. 6th.—"Opposing Forces," H. B. Small.
March 5th.—"Neglected Methods of Education," T. W. Reynolds, M. D.
April 2nd.—"Our Local Museum," A. Alexander, F. S. S.
May 7th.—"Biological Notes," William Yates.
May 7th.—"Our Educational System," Inspector J. H. Smith.

Our membership has been increased by the addition of eight new members and one has withdrawn.

Mr. H. B. Small, of Ottawa, who has represented us so ably during the past few years at the annual meetings of the Royal Society of Canada, has again been appointed our representative at the approaching meeting.

The desirability of effecting some change in the general conduct of our Museum, whereby it might the better meet the modern requirements from such an institution, has received much attention from your Council. As yet, however, through financial considerations, we can suggest no solution of the difficulty.

All of which is respectfully submitted.

A. T. NEILL, *President.*

S. A. MORGAN, B. A., *Secretary.*

INAUGURAL ADDRESS.

Read before the Hamilton Association, November 7th, 1895.

BY PRESIDENT A. T. NEILL.

The influence of an association such as the Hamilton Association should be in the highest and best sense educational. The goal towards which its members are constantly striving is the attainment of scientific truth.

The operation of this association does not come in conflict with the teachings of our schools and colleges, but becomes an auxiliary in the dissemination of scientific knowledge, a field of labor wherein the student who has acquired a theoretic knowledge may pursue practically that particular branch of natural science which best suits his taste and inclination. We are all given faculties possessing apprehensive as well as appreciative powers, and it is our privilege, nay, it is our duty, to assiduously and studiously cultivate those faculties, so that we may be the better able to fulfil the intended object of our mission in this life, and I do not know of a study more elevating, and at the same time more humbling, than the study of natural science; while it teaches the wonders of creation it also teaches the insignificance of man, who presumes to measure his finite mind with the infinite. When once the desire to know is awakened in an individual, and he feels the cravings of a hungry mind, there and then only will his efforts be directed into that particular channel of scientific research which commands his special attention. There will be no insurmountable obstacles to impede his progress, no weakening of purpose, but every energy, mental and physical, will conserve to the accomplishment of the end in view. The apparent difficulty which first meets the student of science is the nomenclature. The adoption of Latin names in describing the genera, species, etc., in parts of a plant, is justifiable where you consider that the field of science is as extensive as the surface of the globe which we inhabit, and consequently embraces

many countries peopled by races speaking different languages. Latin being the basis of many languages, and natural science being considered a branch of higher education, therefore the adoption of Latin to express the names and parts of scientific objects is considered more universal in its application to the different languages of the world, insuring thereby greater uniformity; hence its use.

Consider what confusion would naturally arise if each different speaking nation or people insisted upon calling a particular object by the name expressed in their native language; the sciences would be divided into as many sections as there were different languages, and its general adaptation would be impossible, and although the nomenclature may be and is difficult, yet it is possible to acquire an intimate knowledge of any one of the branches of science by religiously devoting one hour only per day for one year to the study. The man or woman who is an ardent student, as well as an admirer of nature, will not be over-concerned about the foibles, gilt, tinsel or conventionalities of society, because he or she can find more substantial pleasure in the contemplation of the pages of the book of nature.

I would recommend all who hear me to take up some branch of scientific research and make it your special hobby or favorite pursuit, in the exercise of which you develop the body, cultivate and liberalize the mind, thereby rising to a higher and fuller realization of what we are capable mentally of accomplishing. The study of any one of the branches of science to him or her who has passed beyond the rudimentary stage experiences an inexpressible pleasure in the discovery of a single fact, which discovery but opens the door to a further and extended mental view in that particular avenue of thought or research, and although in the next forward step the mental atmosphere may not appear to be so clear, yet, by persistent and faithful application, the apparent cloud of mystery will vanish, and with new light will come fresh knowledge, which is so gratifying to the earnest student. Which of you can go out in the bright and balmy morning of spring and not feel touched by the sense of gratitude when you see around you evidence of returning and renewed life, and when by a little mental reflection you recall to mind the little plant that grew in this quiet nook as if retiring in its nature it sought some secluded spot where it might fulfil its mission undisturbed by the rude hand of

man, or on yon prominent bluff that o'erhangs the rocky steep as if it too was seeking to evade the exterminating hand, and we look expectantly from day to day to see the same varieties occupy the self same places that they did in the year that has gone, and we are not disappointed. The faculty of observation is thus cultivated by such studies so that we can with almost certainty tell where is to be found this or that object of natural history. The more we study natural history the more deeply we are impressed with the innumerable phases it presents to our view.

Here in this museum we are surrounded by objects collected by the different sections—Geological, Biological, Photographical, etc., and as you will have an opportunity to examine the specimens for yourselves, which I have no doubt will prove to be of interest to you, and will engage your attention more fully and satisfactorily than I can in the few minutes left at my disposal, I shall, however, briefly allude to the Geological section of the Association carried on under the direction of the able chairman, Col. C. C. Grant.

This branch of scientific study claims to be one of the most important of all the sections. The effectual work of the members of the Geological section is quite apparent in this museum. See the large number of specimens in the cases, besides a large number of duplicates which are stored away under the side cases, as well as the hundreds which have been sent to different parts of the world by our chairman. Let me say here that the large collection of fossils does not represent the whole work of the members of the section. The term Geology comprises, strictly, a knowledge of the physical history of the earth, as revealed to us by the study of the rock-masses which lie around and beneath us, and by a comparison of the results of ancient phenomena, with the forces and agencies still at work in modifying the surface of the globe. As Geology is thus essentially based on the study of rocks and their contents, and as rocks are made up of a certain number of simple minerals, it is necessary, or at least advisable, to obtain a knowledge of these latter, so as to be able to recognize them where met with, so that the student can assign each fragment of rock, because of its mineral composition, to its proper place in the formation or the system which marks the different geological periods of time in the formation of the rocky crust of the earth. Practical Geology may be ar-

ranged under the following general heads: Lithology, Stratigraphy, Palaeontology and Historical Geology. First, Lithology is the study of the rocks as mineral aggregates and as material composing the earth's crust. Second, Stratigraphy is the consideration of the arrangements of the rocky masses of the earth on a large scale. Third, Palaeontology is the study of fossil remains of plants and animals imbedded in the earth's crust, in connection with the succession of deposits ascertained by Stratigraphical investigation. Fourth, Historical Geology is the application of all the above to the geological history of the earth, and connects the elements of practical geology with the theory and application of the subject.

For the greater convenience of the study of Geology the scientists have divided and sub-divided the rocky structure of the earth into as many divisions as the differences in composition will warrant. In Canada the rocky crust has been divided by the geologist into twelve systems, these again are divided into many formations or groups, representing a particular epoch in geologic time. Those formations in which we in and around the City of Hamilton are more directly interested are called the Medina, Clinton and Niagara formation forming part of the silurian system. In order to be able to distinguish fragments of one from the other we note the well marked deposits composed of clay, sand and lime in such proportions and having imbedded in them certain fossils peculiarly characteristic to them as to be almost certain of their place in the geological chain. They are in some, and particularly in Niagara formation, clearly marked. The bed dividing the above formation from the Clinton is composed of light grey magnesian limestone, weathering yellowish, holding the fossil known as Pentamuous Oblongus in great abundance, to the uninitiated they are mistaken for hickory nuts fossilized. The division between the Clinton and Medina formation is also clearly defined by the deep band of grey sandstone, no doubt well known to many of you. To become a geologist in the proper sense of the word entails much study as well as physical labor. He must be able to pronounce with certainty upon any specimen submitted for his investigation, because of his familiarity with the composition of the different strata in the different formations. I do not think that it would be drawing too largely upon the imagination to

suppose for the present that the different strata are but leaves in the book of nature, and that the fossil remains are but the illustration of the book, which make more lasting impression upon the mind of the geologist, who sees already in his mind the circumstance that placed these remains in their present position. He looks back through the vista of years or eons of time when these animals which lie entombed in their rocky grave glided about in their natural element as the various forms of marine life disport themselves in the lakes, seas and oceans of the present time. In conclusion let me ask, do we, surrounded as we are with rare opportunities to become acquainted with the natural history of this particularly favored district, make the most of our opportunities? I will leave you to answer. But our great business with this life is to read the book of its teaching, and we shall find that life is not the doing of drudgeries, but the hearing of oracles. The ancient mythology was but a leaf in the book, for it peopled the world with spiritual nature, and science, many-leaved, still spreads before up the same tale of wonder.

ACETYLENE GAS.

Read before the Hamilton Association, Nov. 7th, 1895. Enlarged before the Physical Section, May 21st, 1896.

BY MR. GEO. BLACK.

Great inventions and discoveries are often apparently the result of accident, but the seizure of the occasion and turning it to account marks the true scientist. Such was the case when our countryman, Thos. L. Willson, discovered his method of producing calcium carbide, for it was known to chemists as a rare product, as shown by the following references:

Sir Humphrey Davey observed that when Carbon and Potassium were heated sufficiently to vaporize the potassium, a substance was formed which has been recognized as the first reference to a group of carbides.

In 1836 Brezelius announced that the black substance formed in small quantities as a by-product in producing potassium from potassic carbonate and carbon was carbide of potassium.

Wöhler, in 1862, announced that he had made the carbide of calcium by fusing an alloy of zinc and calcium with carbon. He ascertained that it decomposed in contact with water, forming calcic hyrate and acetylene.

Berthelot, in 1866, described sodium carbide or acetylene sodium. He discovered that the high temperature of the electric arc within an atmosphere of hydrogen would unite with carbon of the charcoal terminals and form acetylene gas.

In 1888, Willson, in experimenting with his electric furnace trying to form an alloy of calcium from some of its compounds, noticed that a mixture containing lime and powdered anthracite acted on by the arc fused down to a heavy semi metallic mass, which having been examined and found not to be the substance sought for was thrown into a bucket containing water near at hand with the result

that violent effervescing of the water marked the rapid evolution of a gas, the overwhelming odor of which enforced attention to its presence, and which on the application of a match burned with a smoky but luminous flame and numerous explosions. It was acetylene gas.

To Willson is due the credit of discovering how to make calcium carbide at the price of about one cent a pound in unlimited quantities instead of the rare laboratory product obtained in grains at the rate of about $10.000 per pound, thus producing not only a new light, but for manufacturing and commercial purposes opened up a vast range of new combinations of hydro-carbons at a much cheaper rate than ever existed before. The dream of the chemist has been realized, and synthetic chemistry took several strides forward. The possibilities of cheap carbide for light or chemical combinations places Willson in the front rank of the scientific men of the age.

Calcium carbide $Ca\ C_2$ is described as a dark brown, dense substance, having a crystalline metallic fracture of blue or brown appearance, with a specific gravity of 2.262. In a dry atmosphere it is odorless, but in a moist atmosphere it emits a peculiar smell, resembling garlic or phosphorus. When exposed to air in lumps it absorbs moisture and the surface becomes coated with a layer of hydrate of lime, which to a certain extent protects the rest of the substance from further deterioration. It is not inflammable and may be exposed to the temperature of a blast furnace without taking fire, the exterior only being converted into lime. When brought into contact with water or its vapors at ordinary temperatures it rapidly decomposes, one pound when pure generating 5,892 cubic feet of acetylene gas at a temperature of 64° F.

Calcium carbide is manufactured from powdered lime and carbon in the shape of ground coal, coke, peat or charcoal, these two substances being fused together in an electric furnace. The process is very simple, and may be described, thus:

The lime and carbon, having been ground to a fine powder, is intimately mixed in a certain proportion and fed into a crucible or furnace, the lower part of which has a carbon plate which is attached to one of the dynamo terminals; the other terminal is connected to an upright carbon resembling the upper carbon of an arc lamp, but

much larger, being about three feet long and twelve by eight inches in cross section. An alternating current is delivered by means of transformers to the carbons at about 100 volts and 1000 amperes. A small portion of the mixture is fed into the furnace, the upper carbon is raised about three inches, to form an arc, and the mixture is fused by the intense heat, which ranges from 3,500 to 4,000 degrees C., while that of the ordinary smelting furnace is only 1,200 to 1,500 degrees C. The carbon is gradually raised and fresh mixture fed in till a mass of molten carbide about three feet high is made, when the current is turned off and the carbide allowed to cool. The noise of the arc is said to be very peculiar, especially when the supply of mixture begins to fail.

COST OF CALCIUM CARBIDE.

To positively ascertain the cost of this product the "Progressive Age" of New York sent three commissioners to Mr. Willson's Alluminum factory at Spray, N. C., in March last, to investigate thoroughly, and their report is published in that journal under date of 16th April, 1896. The commission consisted of Messrs. Houston and Kennelly, well-known electricians, and Dr. Leonard P. Kinnicutt, director of the department of chemistry at Worcester Polytechnic Institute, who investigated thoroughly and took full charge of the factory during two separate days, making two runs of the substance and taking samples with them for testing in their own laboratories. Notwithstanding that the factory at Spray was only an experimental one, and the greatest possible output only one ton per 24 hours, and the fact that transportation of material was excessive, costing $3.05 per ton for coke and $4.55 per ton for lime, and estimating $11 per day for labor, including a superintendent at $4 per day, they figure the cost at $32.76 per ton.

Messrs. Houston and Kennelly add a separate estimate for the production of five tons daily under more favorable circumstances, but with water power at $5 per year, as at Spray, and figure the cost at $20.04 per ton. They add: "The cost of producing calcium carb. "electrically, is evidently limited by the cost of lime, coke and elec- "tric power, no matter what the scale upon which the process is "conducted.

"If we assume a perfect electric furnace in which neither ma

"terial nor energy is wasted, that is, a furnace which ensures the "complete union of calcium and carbon without loss and with no "escape of heat in the process, we know that one ton of carbide "would require for its production 1,750 lbs. of lime and 1,125 "pounds of pure coke.

"It has also been calculated from thermo-chemical data that "1½ electrical horse-power hours will be almost precisely the right "amount of energy to produce one pound of carbide, or 3,000 "horse-power hours per short ton of carbide.

"Consequently, if L is the cost of lime in dollars per ton, C "the cost of coke per ton, and P the cost of electrical horse-power "hour, a theoretically perfect plant would yield carbide at a cost "per ton, exclusive of labor and fixed charges, of 0.875 L + 0.5625 "C + 3,000 P.

"For example, if lime (assumed pure) costs $2.50 per short ton, "coke (assumed pure) costs $2.75 per short ton, and an electrical "horse-power of 300 working days of 24 hours each cost $12 at fur- "nace terminals, (0.1667 cent per working horse-power hour), the "limiting cost of carbide in a perfect furnace would be $8.73 per "short ton.

"We may therefore summarize as follows: Calcium carbide "by the electric furnace cannot be manufactured cheaper than $8.73 "per short ton for material and power, exclusive of electrode car- "bons, labor, depreciation, interest and other fixed charges.

"Owing to impurity of materials, and departure from theoreti- "cal perfection in the electric furnaces, we found at Spray the ac- "tual cost of material and power, irrespective of electrode carbons, "labor, etc., is 1.335 L + 1.125, C + 5122 P.

"Under favorable conditions such as we believe can be real- "ized in particular localities, the total cost per short gross ton on a "plant whose output is five tons daily might be $20. Under the "actual conditions existing at Spray during our tests, we find the "total cost to be $32.76 per short gross ton if the plant were worked "continuously."

In the above lowest estimate of Messrs. Houston and Kennelly, they place horse-power at $12, whereas Mr. Willson has secured water power at Spray, and also in Canada, at a cost not exceeding $5 per horse-power.

On this basis, and assuming L at 2.50, C at 2.75 and P 5.00, the figure would amount to 2.18 + 1.55 + 2.00, or a total of $5.81; the cost of lime and coke however is placed at a very low figure, but it is evident that the true theoretical minimum price is between $5.80 and $8.73.

I have also the following estimates of cost at the Niagara Falls establishment, as follows:

To produce one ton of carbide, at the rate of 10 tons per day, it requires—

200 electrical H. P. 24 hours at $20 per year	$10.95
1,440 lbs. coke at $3.50 per ton	2.52
1,800 " lime at $4.50 " "	4 05
Labor, depreciation, etc., &c.	6.18
	$23 70

It is noticeable that this estimate is somewhat in excess of the theoretical values as laid down by Messrs. Houston and Kennelly, and may be improved on as experience is gained.

I was informed that the first run of carbide manufactured at Niagara Falls early in May gave about 25% better results than their estimate, and that they hoped to improve still more as they gained experience and the men got used to their work.

Mr. Willson commenced to erect a factory at Merritton in April on the old Welland Canal, where he has secured 1,500 horse power at Locks 8, 9 and 10, and expects to turn out carbide at the rate of 7½ tons daily at the lowest possible cost. He has also secured a very large amount of power in the Province of Quebec, where he intends to manufacture not only for Canada, but for export to foreign countries.

It is quite evident from the report of the "Progressive Age" Commissioners, and from the experience of the Niagara Falls Company, that calcium carbide can be made and sold at a price to compete with ordinary gas and electric light.

It takes to produce 100 pounds. Ca C2, as shown theoretically, 87½ pounds lime and 56¼ pounds of carbon, of the latter 37½ pounds combine with the calcium and 18¾ pounds combine with the 25 pounds of oxygen of the lime and escapes from the furnace as carbon monoxide, in accordance with the following formulæ:

$$\begin{aligned} Ca\,O + 3C &= Ca\,C_2 + C\,O \\ 87\tfrac{1}{2}\text{ lbs} + 56\tfrac{1}{4} &= 100 + 43\tfrac{3}{4}\text{ lbs.} \\ Ca\,C_2 &= Ca + C_2 \\ 100\text{ lbs} &= 62\tfrac{1}{2} + 37\tfrac{1}{2}\text{ lbs.} \\ C\,O &= C + O \\ 43\tfrac{3}{4}\text{ lbs} &= 18\tfrac{3}{4} + 25\text{ lbs.} \end{aligned}$$

Calcium carbide contains 62.5 parts of calcium and 37.5 parts of carbon in 100, and when brought into contact with water, acetyline is generated to the extent of 5.89 cubic feet of gas to each pound of carbide used; or by weight 100 lbs. of carbide and $56\frac{1}{4}$ lbs. of water evolve 40.65 pounds of acetylene gas, and form 115.62 lbs. of calcic hydrate (slacked lime) in accordance with the following formula:

$$\begin{aligned} Ca\,C_2 + 2H_2O &= Ca\,O\,H_2O + C_2\,H_2 \\ 100 + 56.25 &= 115\,62 + 40.626. \end{aligned}$$

The acetylene gas so generated contains in 100 parts 92.3 parts of carbon and 7.7 parts of hydrogen, or in the 40,625 pounds generated from 100 lbs. of carbide we have $37\frac{1}{2}$ lbs. of carbon and $3\frac{1}{8}$ lbs. of hydrogen.

Acetylene can be produced from carbide by the addition of water and distributed and stored in a gasometer, or the gas may be compressed into a liquid and kept in a suitable cylinder and drawn off as required for consumption, a reducing valve being adjusted to give the necessary pressure for burning, one cubic foot of liquid expands into 400 cubic feet of illuminating gas, so that a large supply may be stored in a very small space; but for experimental purposes, and for a limited supply, it is preferable to make the gas direct from carbide and store it in a gasometer.

The pressure necessary to liquify acetylene depends upon the temperature. At 65° it requires a pressure of nearly 600 lbs., at 32° 323 lbs., at 28.6° below zero 135 lbs., and at 1,160° below zero 15 lbs. We see that there is no danger of freezing it at any habitable place.

As an illuminant acetylene surpasses in brilliancy all other illuminants known. When burned at the rate of five cubic feet per hour it gives 240 to 250 C. P., whereas the best coal or water gas rarely exceeds 22 candles for each five cubic feet burned per hour. Acetylene gas thus gives 10 to $12\frac{1}{2}$ times the light of ordinary gas, or 1000

feet is equivalent to 10,000 to 12,500 of ordinary gas. Acetylene is a commercially pure gas, containing 98 per cent acetyelne and 2 per cent of air; the latter having slight traces of other substances, it is clear and colorless, with specific gravity of 0.91.

When a light is applied to acetylene in open air it burns with a bright yellow but very smoky flame on account of its extreme richness in carbon, but when confined and delivered under suitable pressure it gives an extremely white light, resembling the oxy-hydrogen light and is the nearest in color and purity to sunlight of any known artificial light.

ITS POISONOUS NATURE.

Acetylene when made from expensive chemicals was know to be very poisonous, but as made from lime and carbon it is proved to be less injurious than ordinary gases; its strong pungent smell is a safeguard, as no one can remain in an atmosphere of it a sufficiently long time to be harmed. Handy for hotels where the guests blow out the lights. In such an event the "Blowhard" could not get asleep before he or some one else would be compelled to investigate. The effect on the human system is rather to intoxicate than stupify, and while it is absorbed by the blood it does not form combinations with it, it asphyxiates less rapidly than ordinary gas. Moissan, of France, and others made exhaustive experiments with the greatest care with acetylene and coal gas on animals, and proved conclusively that coal gas was very much more poisonous than acetylene.

EXPLOSIBILITY.

Acetylene, when mixed with one and a quarter times its volume of atmospheric air becomes slightly explosive, and reaches its maxim explosibility with five volumes of air, so that ordinary gas is more explosive than acetylene. Accidents and explosions reported recently have given the impression that the gas it very dangerous. Let us examine this feature. Take the case of the accident in Quebec last winter. An ingenious mechanic made his own dynamo, furnace and carbide; he was experimenting with the gas under pressure to liquify it so as to get it into the smallest possible space, he had an iron pipe eight inches long and four inches in diameter with cast iron ends, a pressure guage at one end and a valve at the other;

he had reached a pressure of 360 lbs. to the inch, and observing that the gas was escaping around the valve he used a hammer to stop the leak when a portion of the metal broke away and the gas escaping struck him in the eye penetrating his brain and killing him instantly. Ordinary air under similar conditions would have been as fatal. It was afterwards found that the iron ends were thin and porous and the wonder was that they stood the pressure; there was no explosion; the coroner's verdict was "accidental death."

The explosion at New Haven, Conn., 21st January last, was caused by men experimenting with liquid acetylene, under a pressure of 600 pounds to the inch; and I presume all accidents reported might be traced to unauthorized parties experimenting with crude apparatus and ignorant of the necessary conditions for safety. We know that air, water, gas, or electricity, are dangerous under certain conditions, but harmless when properly controlled, and it is no argument against acetylene that it is also dangerous when improperly handled.

EFFECT ON ELECTRIC LIGHTING.

When I first saw acetylene gas in September, 1894, I felt sorry for the electric companies, because I thought the gas companies would readily adopt the new gas and regain their former monopoly of lighting. But I do not feel quite so downcast now; I realize that the margin of cost of production is not so great and believe that gas companies will feel the competition equally with electric unless they adopt the new gas for use pure, or as an enricher to their present output; it is said to be useful as an enricher for coal gas but not so suitable for water gas.

Prof. Lewes of England, one of the best gas authorities there, suggests that gas companies should distribute a low illuminating coal gas of about 12 C. P. through their mains for heating, cooking, etc, and that each place using illuminating gas be supplied with a cylinder of acetylene to be fed into the illuminating pipes in a certain determined proportion; by some such process as this there remains a large field for coal gas, otherwise coal and water gas must go.

The incandescent light has held first place for interior illumination on account of its steadiness, purity, coolness, and not withdrawing oxygen from the air nor adding noxious elements to it. Acetylene will divide this field with the incandescent bulb; it is a

pure white steady light, of low heating power, withdraws very little oxygen from the air, and does not add impurities to any great extent; its flame has a temperature of 900 to 1,000 degree C, while ordinary gas has 1,400 degree C, but as only one-tenth to one-fifteenth of the quantity is used for equal light, its heating effect is slightly in excess of the incandescent bulb.

Taking the theoretical E. H. P. necessary to produce one ton of carbide as 3,000 horse-power hours, and using the same for a supply of electric light by incandescent 4 Watt lamps, we have the following:—3,000 x 746 = 2,238,000 Watts ÷ 64 gives 34,970 16 C. P. lamps for one hour, or 1,453 burning 24 hours continuously.

The same power equals one ton carbide, which burned in $\frac{1}{3}$ foot burners gives 31,500 16$\frac{2}{3}$ C. P. lights or 1,213, burning twenty-four hours. This gives a margin apparently in favor of electric lighting; but you cannot use all your electric lights at the source of cheapest production, nor run a continuous even load for twenty-four hours, but have in addition to sustain losses in distribution more than proportionate to the distance conveyed; also lamp renewals. With the carbide it is different, it can be made at the place of cheapest production on a constant load night and day, and a small sum transports the carbide to any place desired, where it can be used to its full power without loss. Figure out for yourselves the problem of transmitting electric current for use 10 to 100 miles from source of production and transporting carbide by freight the same distance, and the comparison will be largely in favor of carbide. Hence for use in close proximity to the power house on a steady even load day and night, the cost will be about the same if power cost the same, but as that is not practicable in electric lighting the margin is in favor of carbide, but not to such an extent as to seriously hurt the electric companies employing the best apparatus under the most approved conditions, as may be found in large cities, but it is possible in small towns where the best and most economical conditions cannot be obtained, and a thorough manager secured, well up in the scientific as well as the practical conditions, electric lighting may suffer.

The ease of distributing acetylene is remarkable; owing to its high illuminating power very small main pipes may be used, and as frost does not effect it the pipes need only be laid below the surface,

so that little or no expense need be incurred in piping a town. If the cost of mains equal cost of poles and wires the central station or gas house only requires a small tank for a generator, and a gasometer of suitable size; as compared with engines, boilers and dynamos running when only one light is required.

We may then conclude that in the race for supremacy closer economy will be practised, better service given, the public will be benefitted, all will let their light shine to the best of their ability, and the one best deserving of patronage will survive.

THE NEW ONTARIO.

A Paper read before the Hamilton Association, January 16th, 1896.

BY ARCHIBALD BLUE, ESQ.

The New Ontario is a title which in the common use describes all that part of the Province lying beyond the Mattawan and French rivers and the Nipissing, Huron and Superior lakes, to the north and west boundaries. These boundaries, now clearly defined and established by an Imperial statute, were for nearly twenty years a subject of keenly waged dispute between the Governments of Ontario and the Dominion; and at one time, after Manitoba had been projected into the quarrel, feeling ran so high that recourse to arms was imminent. The extent of country involved in this dispute, while very much larger, is perhaps not less valuable in its resources of timber and minerals than the region in dispute between Guiana and Venezuela, over which the two great Anglo-Saxon nations were just now talking of war. In one important particular, too, there is a close parallel in the conduct of the negotiations. The President of the United States has named commissioners to determine what is the true divisional line between British Guiana and Venezuela; and this work being done, he declares it will be "the duty of the United States to resist by every means in its power, as a wilful aggression upon its rights and interests, the appropriation by Great Britain of any lands or the exercise of governmental jurisdiction over any territory which, after investigation, we have determined of right belong to Venezuela." The Government of Canada also, at an early stage in the negotiations with Ontario, and before any limits were proposed or discussed, appointed a commissioner and authorized him to proceed and trace out, survey and mark the boundaries on the west and north of the Province according to the specific and definite instructions given to him. The same arbitrariness appears in both cases; but in the action of the Government of Canada in 1872 there was a

tangible interest at stake, and in the action of the Government of the United States in 1896 there is nothing but a sentiment. Had the Government of Ontario tamely acquiesced in the instructions issued from Ottawa, instead of vigorously contesting their claim to the final award, it would have meant to this Province the loss of 100,000 square miles of territory.

The New Ontario lies within boundaries declared by the Imperial Parliament in 1889, in an Act passed in accordance with the terms of an address from the Senate and Commons of Canada presented to the Queen in that year. These boundaries are substantially the same as those agreed upon in 1878, in the award of the arbitrators appointed by the Dominion and Ontario Governments, but subsequently repudiated by the Dominion Government; and, as far as they go, they are identical with the boundaries found by the Judicial Committee of the Privy Council in 1884. In the schedule to the Imperial Act they are described as follows:

"Commencing at the point where the international boundary between the United States of America and Canada strikes the western shores of lake Superior, thence westerly along the said boundary to the northwest angle of the Lake of the Woods, thence along a line drawn due north until it strikes the middle line of the course of the river discharging the waters of the lake called lake Seul, or the Lonely lake, whether above or below its confluence with the stream flowing from the Lake of the Woods towards lake Winnipeg, and thence proceeding eastward from the point at which the before mentioned line strikes the middle line of the course of the river last aforesaid, along the middle line of the course of the same river (whether called by the name of English river, or as to the part below the confluence, by the name of the river Winnipeg) up to lake Seul, or the Lonely lake, and thence along the middle line of lake Seul or Lonely lake to the head of that lake, and thence by a straight line to the nearest point of the middle line of the waters of lake St. Joseph, and thence along that middle line until it reaches the foot or outlet of that lake, and thence along the middle line of the river by which the waters of lake St. Joseph discharge themselves to the shore of the part of Hudson bay commonly known as James bay, and thence southeasterly, following up the said shore to a point where a line drawn due north from the head of lake Temiscaming

would strike it, and thence due south along the said line to the head of the said lake, and thence through the middle channel of the said lake into the Ottawa river, and thence descending along middle of the main channel of the said river," etc., to a stone boundary on the north bank of lake St. Francis in the St. Lawrence river.

The eastern boundary of the Province was first determined in 1791 by the Imperial Order in Council establishing the Provinces of Upper and Lower Canada, including the section of it from the head of lake Temiscaming defined by "a line drawn due north until it strikes the boundry line of the Hudson bay." The exact starting point of this line was finally fixed in 1872, by agreement between the Governments of Ontario and Quebec, in 1873 and 1874 it was surveyed as far north as the height of land by joint commissioners appointed for the purpose, and in 1874 the line was ratified by the Legislatures of the two Provinces. As laid down on the maps, it starts from the parallel of 47° 33′ 48″ 37‴ and is as nearly as may be along the meridian of 79° 30′ west from Greenwich. The western boundary is only the meridian of the northwest angle of Lake of the Woods, and the joint commissioners under the Treaty of Ghent ascertained this point to be in latitude 49° 23′ 55″ north, and in longitude 95° 14′ 38″ west from Greenwich.* The New Ontario therefore extends across 15° 44′ 38″ of longitude, which on the latitude of 50° measures 701 statute miles.†

The greatest breadth from north to south, measured from the mouth of the Spanish river in Georgian bay to the mouth of the Albany river in James bay (or say from 46° 15′ to 52° 30′ north latitude) is about 430 miles, and the least is along the western boundary, where it is about 80 miles. From the mouth of Pigeon river on the Minnesota boundary to the foot of lake St. Joseph, near the meridian of 90°, it is about 215 miles; from Fort Michipicoten on the east shore of lake Superior to Henley House on the Albany river, along the meridian of 85°, it is about 240 miles; and the average breadth is probably 250 miles. The area has been variously estimated; it is not less than 150,000 square miles, and it may be

* Report of the Commissioners under the Treaty of Ghent made 23rd October, 1826. Hertslet's Treaties, vol. xiii, pp. 898-9.

† The length of a degree of longitude on the parallel of 50° is 235,171 feet, or about 44.44 English statute miles.

175,000 square miles. Even at the lower of these estimates it is larger than Minnesota and Wisconsin by 16,000 square miles, larger than Wisconsin and Michigan by 44,000 square miles, larger by 7,000 square miles than three States the size of New York, and larger than our part of Ontario south of the French and Mattawan rivers by about 100,000 square miles. The passenger train on the Canadian Pacific Railway which leaves Mattawa at the mouth of the Mattawan river at 8 11 o'clock Monday evening, and goes at a speed, including all stops, of 25¼ miles per hour—through North Bay and Sudbury, coasting the north shore of lake Superior 195 miles from Heron Bay to Fort William, and on through Rat Portage at the foot of Lake of the Woods—does not reach Ingolf station near the Ontario and Manitoba line until 11.57 a. m. on Wednesday. But the length of the run is 1,004 miles.

From these figures and comparisons it is seen that the New Ontario is a large country—doubtless much larger than most of us down here have ever conceived or suspected, for I think it must be confessed that even the best informed among us have a great deal yet to learn of its lengths and breadths, as well as of its physical aspects and varied resources.

GEOLOGICAL HISTORY OF THE REGION.

But is not the title of the New Ontario something of a misnomer? May we not say that it is really the Old Ontario? Is it not the very oldest part of our continent, and has it not furnished the materials out of which not alone this lower Ontario but many States across the great lakes have been built up? Almost the whole extent of it, all excepting a portion of the Hudson Bay slope and a small area around lake Temiscaming, is a mountain built country. Through long cycles of time the most conspicuous physical feature in North America was the high range of Archæn rocks which swept in a magnificent curve through what is known in our time as the regions of Labrador, Quebec, Ontario and the Northwest Territories, around the head of Hudson bay, from the Atlantic ocean in the east to the Arctic in the north. These rocks covered an area of over 2,000,000 square miles, and we can hardly guess the height to which they were raised by the forces that heaved them into mountain masses long, it may be, before there was any sea. The average

elevation is from 1,500 to 1,600 feet above the present sea level according to Logan, and probably less than 1,000 feet according to Selwyn. There are many points of 2.500 to 3,000 feet; in the Adirondacks are mountains more than 5,000 feet above the sea; and along the eastern and northern coasts of Labrador are chains estimated at heights from 5,000 to 10,000 feet. It is supposed that the denuding forces were not so great or so active in Labrador as farther west; and having in view the immense extent of the sedimentary formations, from at least the base of the Huronian upwards through the Cambrian, Silurian and Devonian systems to the relatively recent glacial drift which cover the region of the lakes and beyond them south and west to a depth in places of many thousands of feet, and the fact that the materials of all these excepting part of the limestones were derived from the ancient rocks of the north, the conclusion appears to be irresistible that the range or ranges, for probably there were several parallel ones, must have reached a lofty height throughout their whole extent. Logan, about forty years ago, gave to this primitive nucleus of the continent the name Laurentian, from the rocks which compose it forming the high mountainous country known as the Laurentides, which extend for nearly a thousand miles north of the river St. Lawrence from Quebec into Labrador. He maintained that the rocks of the Laurentian system are almost without exception old sedimentary beds which by action of heat have become highly crystalline, composed of schists, felspars, quartzites and limestones, with intrusive masses of granites, syenites and diorites, and that their aggregate thickness is not less than 30,000 feet. It seems probable however that a number of the rocks which Logan has described as stratified are of purely igneous origin, and that their foliated structure is a result of folding and shearing when under great pressure they were being raised into mountain forms. The fine-grained hornblende-gneisses, the mica-gneisses and the chlorite-gneisses are of this class, and are often traced into massive granites and granitoid gneisses, which are clearly igneous. "All of these rocks," Van Hise says, "are completely crystalline. None of them show any unmistakeable evidence of having been derived from the sedimentaries, but many can be traced with gradations into massive rocks, and therefore the greater proportion of them are igneous, if a completely massive granular struc-

ture be proof of such an origin."* So also Dr. Adams affirms that the indistinct foliation of the fundamental gneiss—a term used to designate the lower portion of Logan's Lower Laurentian,—is not in many cases "a survival of original bedding, but is clearly due to movements in a plastic mass." Of the upper portion of the Lower Laurentian, known as Logan's Grenville series, Dr. Adams appears to think that the crystalline limestones and gneisses, while showing great dynamic action, are in all probability made up in part if not wholly of sedimentary material, often occurring in well defined bands or layers like the strata of later formations. But as regards the so-called Upper Laurentian, which embraces the Anorthosite or Norian series of Logan, his view is that their igneous and intrusive character is well established; and that while they frequently show a distinct and often a perfect foliation, they are but eruptive masses which have found their way upward by cutting the rocks of the fundamental gneiss and the Grenville series, in many cases being thrust between the bands or strata of the latter in directions of least resistance and having foliation induced in them under pressure while deeply buried and very hot.† The fact is however that there are many points upon which the authorities are not yet agreed, either as regards the origin, age, classification or nomenclature of the older rocks.

For the present purpose it is enough to be assured that while there are large areas in which eruptive masses of granite and gneiss have penetrated the Huronian rocks and thrown them into folds, proving thus their later age, in general the reverse is the case—the Huronian resting unconformably on the Laurentian and being therefore of later origin; that the Cambrian, Silurian and Devonian systems are in regular order more recent than the Huronian; and that these successive systems of rocks have been built out of the ruins of the underlying ones.

In the course of secular cooling, it may safely be assumed, the crust of the earth became folded by contraction to form high mountains and deep valleys, and when after the lapse of long ages the temperature had fallen to the point at which water might form and accumulate the processes of degradation and upbuilding must have

* Journal of Geology, vol. I., p. 115.
† Journal of Geology, vol. I., pp. 328-334.

gone forward rapidly. The atmosphere, the rains and the hot waters became effective agencies in altering the physical features of the earth by erosion, and the fundamental rocks began to be covered by the sedimentaries. But the internal forces were active yet and for ages after; the mountain-making folding continued, and great masses of igneous rocks were intruded into the cooling crust or extruded upon it. The waters of the sea grew in volume, the Archæan highlands subsided, and once or twice in their history, if not oftener, they were over a very large extent submerged. In that sea the Huronian rocks—possibly a portion of the Laurentian also, and the foliated members of it certainly if they are sedimentary—were laid down, but we have no data for calculating their mass. The Huronians extended over large areas to the north and south, much of which is hidden by overlying deposits; in the typical region north of lake Huron their thickness was computed by Murray to be 18,000 feet, and their aggregate thickness as originally laid down may have been not less than 40,000 or 50,000 feet. At two successive periods in their history the rocks of this great system were folded and tilted into mountain forms, followed by two long periods of active erosion during which the denudation was deep enough to remove the entire series in places, and wear the mountains down to stumps. How far if at all, glacial agencies operated in this cutting down and carrying away of Huronian material to construct new systems, there is no means of determining; but there is nothing improbable in the supposition that they were as active in those early ages of the earth as they have been in the later period, the record of which the ice has so left written upon the face of the rocks that we may read it.

Following the Huronian system by the classification of the Canadian geologists, there come next in order the formations of the Cambrian system, embracing the Animikie, Nipigon and Potsdam, with an aggregate thickness of 54,000 feet according to some measurements, and of 63,000 feet according to others. The Nipigon alone has a thicknees computed at 50,000 feet, composed almost wholly of gabbros, diabases, amygdaloids and lavas ejected through fissure and crater during a long period of volcanic activity, and resulting in the great east and west synclinal which forms the basin of lake Superior.

After the Cambrian rocks came those of the Silurian system

with a thickness in lower Ontario of over 4,000 feet, and after these we have a few formations of the Devonian with a thickness of 600 feet, the most recent of which are probably older than lake Huron, lake Erie or lake Ontario.

Now from the close of the Laurentian system considerable areas of our so-called New Ontario have been dry land; and what length of time elapsed in the interval between the end of the Laurentian age and the deposition of the Chemung and Portage beds, which are the most recent of the lower Ontario formations, we may possibly conceive when it is ascertained that the aggregate thickness of the rocks is 18 to 22 miles. Or if we take only the period from the close of the Nipigon formation, during which fully three-fourths of the New Ontario was dry land, and all except the pre-Cambrian portion of lower Ontario was under the sea, we find that enough time had elapsed for the deposition of strata more than a mile in thickness. And that time must have been relatively long, as none of the rocks are of igneous origin; all are sedimentary.

Obviously therefore, when looked at from the geological point of view, the title of the New Ontario is something of a misnomer.

How does it appear when looked at in the light of modern history, of written documents and annals?

ITS HUMAN HISTORY.

There are few places in southern Ontario whose beginnings cannot be found within the limits of a century. Fort Frontenac, on the site of Kingston, was built in 1673, and Fort Rouille, on the site of Toronto, about 1750, and these were the only important posts in our part of the country during the French occupation. There were no settlements worthy of mention excepting those on the Detroit river until after Canada had been acquired by the British; and then the earliest were those formed by the loyalists at the close of the American war for independence. Kingston and Niagara were the first towns, and they date their origin from 1783. The first houses in Toronto were built in 1794, and the town plot of Hamilton was not laid out until 1813.

But in the New Ontario of the north the fur traders, both French and English, began active business more than two centuries ago, and many forts and posts were established throughout the re-

gion. The Hudson's Bay Company obtained its charter from Charles II in 1670, and throughout the territory known as Rupert's land it was active and dominant for a period of two hundred years, or until the surrender of the territory to the Queen in 1869, at which time it occupied about twenty-five forts and trading posts within Ontario limits. Fort Albany, at the mouth of Albany river, was built by this company in 1683 or 1684, Henley House on the same river in 1744, and in 1730 a fort upon the Moose at or near where Moose Factory now stands. But the French traders were earlier on the field than the English, and for nearly a century they occupied a much larger extent of it. In 1673, the same year in which Fort Frontenac was built, they established two trading posts near the parallel of 50°, one on the Abitibi river and the other on the Missinaibi. The intrepid explorer, Daniel Dulhut, whose name is preserved in Duluth, built a fort at the mouth of the Kaministiquia river in 1678, and called it Caministoygan; and before 1684 he built another far inland, the sight of which is supposed to be at the foot of lake St. Joseph, on the northern boundary. The French also built a fort at the mouth of the Moose river in 1686, and a post at the foot of Abitibi lake before 1688. Their post at Sault Ste. Marie was established in 1670, three years before Fort Frontenac was built; and in 1731 they had reached the head of Rainy river, where La Verandrye built Fort St. Pierre, the ruins of which are yet visible under the shadow of stately trees, which have grown from seed to maturity since the time it was deserted.* The site of Fort St. Pierre, as well as that of Fort Frances, two or three miles below it, is one of the most beautiful in the New Ontario.

But with the loss of Canada the activity and enterprise of the French traders passed away, the blithe and hardy coureurs des bois were scattered, and for the next twenty years the Hudson's Bay Company enjoyed a monopoly of the trade in peltries with the Indians, saving the extent to which a few individual merchants and small companies in Montreal were able to send their agents and goods into the country.

*"At the entrance of the river there is a rapid," Sir Alexander Mackenzie wrote in 1801, "below which is a fine bay, where there had been an extensive picketed fort and building when possessed by the French; the site of it is at present a beautiful meadow, surrounded with groves of oaks." Voyages from Montreal, p. lvi.

In 1783 however, a new competitor arose when the Northwest Company was organized, and until the two companies united in 1821 their rivalry was a strife that broke out once or twice into war. The new company was composed largely of Highland Scotch merchants, and most of their officers and clerks and many of their employees were of the same nationality; but they also recruited into their service large numbers of the forest runners trained up in the palmy days of the old French traders. The enterprise of the company was shown by the construction of a canal at Sault Ste. Marie, which was open to navigation in the summer of 1800, being fifty-five years before the completion of the canal on the American side. It had also a shipyard at the beautiful sandy point a few miles above the falls, known as Pointe aux Pins, once covered with red and white pine, the best of which were cut down and used for building the company's vessels for navigating the waters of Lake Superior before the close of last century.*

Such instances of active enterprise no doubt go far to justify the belief expressed by Masson that had it not been for the quarrel of the Northwest Company with Lord Selkirk and the amalgamation with the Hudson's Bay Company in 1821, "the opening up of a line of communication between Canada and the Northwest Territories, and consequently the settlement of that country from Canada, would have been advanced by a quarterr of a century." The interests of the Northwest Company, Mr. Masson says, were intimately bound up with those of Canada, while those of the Hudson's Bay Company were in an entirely opposite direction.† So bright indeed

*In the winter of 1770 Alexander Henry and his associates in a mining enterprise on the north and south shores of Lake Superior, built a barge fit for the navigation of the lake, at their shipyard at Point aux Pins, and laid the keel of a sloop of forty tons; but it was not until August of 1772 that the sloop was launched.—Henry's Travels, pp. 226 and 234.

† In Cauchon's memorandum it is stated that the Canadian Northwest Company were everywhere in advance of their rivals. "They were the first to spread themselves beyond the limits of the French, over the prairies of the Saskatchewan; they were the first to discover the great river of the north, now bearing the name of Mackenzie, and pursue its course to its discharge in the frozen ocean; they were the first to penetrate the passes of the Northern Cordilleras and plant their posts upon the shores of the Pacific; and with such indomitable energy did they carry on their business that, at the period of Lord Selkirk's interference, they had upwards of 300 Canadians, 'voyageurs,' employed in carrying on their trade to the west of the Rocky Mountains."

seemed the outlook for Sault Ste. Marie at one time that it was pointed out as offering the best market for the farm products of the country around Toronto. "The soil in the neighborhood of York (Toronto) is said to be rich," John Johnston of the Sault wrote in 1809, "and the farmers could raise a vast quantity of provisions, were they encouraged by having a sure market for them. This could easily be accomplished by opening a communication with the Bay of Machedash, from whence to the Island of St. Joseph the distance is only ninety leagues. From the bay, a chain of islands extends to the northwest, of which St. Joseph is the last; these render the navigation perfectly safe, as you may either keep outside of them or between them and the shore, with safe anchorage everywhere. By this channel, provisions may be brought to St. Joseph, St. Mary and Michilimackinac in half the time and for half the expense they are procured from Sandwich, Detroit, etc., and the returns from the above places would arrive much sooner and safer at Montreal." Concerning the fortunes of Matchedash itself under this scheme, Johnston had not a doubt on his mind "but that it would soon become the most thriving place in Upper Canada, and the centre of provisions and transport trade for the fur countries."*

But the chief seat of the Northwest Company's enterprise was on the north shore of lake Superior. Fort Charlotte, the place first selected, was at Grand Portage, at the mouth of Pigeon river. Fearing however that it might be within the United States boundary, a new location for business headquarters was chosen at the mouth of the Kaministiquia river and named Fort William, after William McGillivray, one of the partners of the company.† It soon became the

* John Johnston's Account of Lake Superior in Les Bourgeois de la Campagnie du Nord-Ouest, by L. R. Masson, vol. II.

† The first fort on this river was built by Dulhut in 1678, and it was re-built by LaNoue under instructions from the French Government in 1717. The name Kaministiquia (which has undergone many modifications of orthography) is said by John Johnston to mean the "river of difficult entrance," and by Sir John Richardson the "river that runs far about," while Dr. Bigsby translates it "the river of the isles."

A further interesting narrative of how the seat of the fur trade on lake Superior came to be transferred from Fort Charlotte to Fort William is given by Dr. Bigsby: "During great part of the eighteenth century," Dr. B. writes, "before the union of the Indian traders into one company, the Northwest, the Lake Superior end of the Grand Portage was a pent-up hornet's nest of conflicting factions intrenched in rival forts. The traders first coalesced into two companies, one called the 'X. Y. Company,' from a

most important post north of the great lakes, and at some seasons of the year the number of traders assembled there was not less than 3,000, gathered from all quarters of the Northwest to which the operations of the company had extended.

But Fort William was something more than the central depot for the exchange of furs and goods. It was the meeting place where the affairs of the company were planned every year between a few of the leading partners at Montreal and partners from the various trading stations in the wilderness. "Here, in an immense wooden building," to quote Washington Irving, "was the great council hall, as also the banqueting chamber, decorated with Indian arms and accoutrements, and the trophies of the fur trade. The house swarmed at this time with traders and voyageurs, some from Montreal, bound to the interior posts, some from the interior posts bound to Montreal. The councils were held in great state, for every member felt as if sitting in parliament, and every retainer and dependent looked up to the assemblage with awe, as to the house of lords. There was a vast deal of solemn deliberation, and hard Scottish reasoning, with an occasional swell of pompous declamation. These grave and weighty councils," Irving goes on to say, "were alternated by huge feasts and revels, like some of the old feasts described in Highland castles. The tables in the great ban-

mark placed on their pack, and consisted of Sir Alexander McKenzie and Messrs. Ogilvy, Richardson and Forsyth; and of the Northwest Company, at whose head were Messrs. W. and S. McGillivray, McTavish and others. Latterly both these firms united to contend with the old Hudson's Bay Company, acting under the charter of Charles the Second and later parliamentary sanction. The American Government, properly conceiving that the Grand Portage, the centre of so much commercial activity, was within their territory, signified about the year 1802, to the amalgamated company, now called the Northwest Company, their intention of imposing a duty of from twenty to twenty-five per cent. on all goods landed there. After having in vain offered a composition of five per cent., the Northwest Company abandoned the place, but not before they had well examined the Pigeon river from the north end of the Grand Portage down to lake Superior. Sir Alexander McKenzie occupied a long time in this task, accompanied by two Indians, but they found that high falls, rapids and shelving precipices rendered the river utterly impracticable for commercial purposes. The company then built their Fort William, and made the Dog river and other streams and lakes their road into the Northwest fur countries, although this is inferior in every respect to the old route, so much so, that the voyageurs had to be coaxed and bribed into the use of it. I am obliged to Mr. Astronomer Thompson for this information."—The Shoe and Canoe, or Pictures of Travel in the Canadas, by John J. Bisby, M. D., vol. II, pp. 240-1.

queting room groaned under the weight of game of all kinds; of venison from the woods, and fish from the lakes, and hunters' delicacies, such as buffaloes' tongues and beavers' tails; and various luxuries from Montreal, all served up by experienced cooks brought for the purpose. There was no stint of generous wine, for it was a hard-drinking period, a time of loyal toasts, and bacchanalian songs, and brimming bumpers."*

Neither Toronto, nor Niagara, nor Kingston could approach the commercial greatness of Fort William ninety years ago; and in no part of the interior of the lower peninsula were such scenes of activity to be witnessed as along the highways of trade in the interior of the northern country, from the Ottawa river to Lake of the Woods.

From lake Superior there were two routes to the Northwest: one from Grand Portage through the boundary waters to Rainy lake, and the other up the Kaministiquia river and Dog lake, across the long portage to Savanne river, and thence through Lac de Mille Lacs and a succession of smaller lakes, down the Maligne and Meccan or Namakan rivers into Rainy lake. The latter was the route usually

* Irving's Astoria, p. 8 (Bohn's edition). The X. Y. Company, which was a section of the Northwest Company, detached from it in 1796, but reunited with it in 1804, and had its headquarters at Grand Portage. The mode of living there is described as follows by Sir Alexander Mackenzie, (Voyages from Montreal, p. xlvi): "The proprietors, clerks, guides and interpreters mess together, to the number of sometimes an hundred, at several tables, in one large hall, the provision consisting of bread, salt pork, beef, hams, fish and venison, butter, peas, Indian corn, potatoes, tea, spirits, wine, etc., and plenty of milk, for which purpose several milch cows are constantly kept. The mechanics have rations of such provisions, but the canoe-men, both from the north and Montreal, have no other allowance here, or in the voyage, than Indian corn and melted fat. The corn for this purpose is prepared before it leaves Detroit, by boiling it in a strong alkali, which takes off the outer husk; it is then well washed, and carefully dried upon stages, when it is fit for use. One quart of this is boiled for two hours, over a moderate fire, in a gallon of water; to which, when it has boiled a small time, are added two ounces of melted suet; this causes the corn to split, and in the time mentioned makes a pretty thick pudding. If to this is added a little salt (but not before it is boiled, as it would interrupt the operation), it makes a wholesome, palatable food, and easy of digestion. This quantity is fully sufficient for a man's subsistence during twenty-four hours, though it is not sufficiently heartening to sustain the strength necessary for a state of active labor. The Americans call this dish hominee." In a foot note Sir Alexander adds that corn is "the cheapest provision that can be procured, though from the expense of transport the bushel costs about twenty stirling at the Grand Portage. A man's daily allowance does not exceed tenpence."

taken by the Northwest Company's traders; and from the pen of R. M. Ballantyne, who came over it on his way from Norway House to Montreal in 1845, we have a graphic picture of the scenes that must have been witnessed along those waterways for well nigh forty years, covering the close of the eighteenth and the beginning of the nineteenth century. "Many years ago, in the time of the Northwest Company," Ballantyne writes, "the echoes among these wild solitudes were far oftener and more loudly awakened than they are now. The reason of it was this: The Northwest Company, having their headquarters at Montreal and being composed chiefly of Canadian adventurers, imported their whole supplies into the country and exported all their furs out of it in north canoes by the same route over which we now travelled. As they carried on business on a large scale, it may be supposed that the traffic was correspondingly great. No less than ten brigades, each numbering twenty canoes, used to pass through these scenes during the summer months. No one who has not experienced it can form an adequate idea of the thrilling effect the passing of these brigades must have had upon a stranger. I have seen four canoes sweep round a promontory suddenly and burst upon my view, while at the same moment the wild, romantic song of the voyageurs, as they plied their brisk paddle, struck upon my ear; and I have felt thrilling enthusiasm on witnessing such a scene. What then must have been the feelings of those who had spent a long dreary winter in the wild northwest, far removed from the bustle and excitement of the civilized world, when thirty or forty of these picturesque canoes burst unexpectedly upon them, half shrouded in the spray that flew from the bright vermilion paddles, while the men, who had overcome difficulties and dangers innumerable during a long voyage through the wilderness, urged their light craft over the troubled waters with the speed of the raindeer, and with hearts joyful over the happy termination of their trials and privations, sang with all the force of three hundred manly voices one of their lively airs, which rising and falling faintly in the distance as it was borne. first lightly upon the breeze, and then more steadily as they approached, swelled out in the rich tones of many a mellow voice, and burst at last into a long, enthnsiastic shout of joy. Alas!" Mr. Ballantyne exclaims, "the forests no longer echo to such sounds. The passage of three or four canoes once or twice a year is all that

breaks the stillness of the scene; and nought save narrow pathways over the portages, and rough wooden crosses over the graves of the travellers who perished by the way, remains to mark that such things were."*

Such was our New Ontario under the regime of the trading companies; it had an early beginning as compared with the Ontario of the south; but the stronger of the companies absorbed or devoured the weaker, and while large profits were earned the country was not in the faintest degree bettered in the end by their operations. It had always indeed been the policy of the Hudson's Bay Company to keep up the primeval state of the forest, as the founding of settlements was incompatible with the life of the fur trade. Moreover, history teaches the lesson that a company organized with powers of government and exclusive rights to carry on trade in a country has for its first consideration the commercial idea, and everything else is subordinate. The Hudson's Bay Company had no other thought for the two centuries during which it held sway in northern Canada than how the largest dividends could be earned for the shareholders. So it was with the English East India Company, whose over-ruling hand was felt in India for more than two and a half centuries, down to the close of the mutiny. And so we have just seen it to be with the British South Africa Company, whose filibustering raid into the Transvaal came perilously near to plunging Europe into war. The Hudson's Bay Company relinquished its authority overy the territory of northern Ontario—the portion of it beyond the height of land—in 1869; but it took twenty years to settle the disputes which arose afterwards between the Dominion and Provincial Governments as to the true boundaries and the ownership of

*R. M. Ballantyne's Hudson's Bay, pp. 279-80. As descriptive of the kinds of canoes used by the fur traders, Mr. Ballantyne says: "A number of canôtes de maitre, or very large canoes, are always kept in store here (Fort William) for the use of the Company's travellers. These canoes are of the largest size, exceeding the north canoe in length by several feet, besides being much broader and deeper. They are used solely for the purpose of travelling on lake Superior, being much too large and cumbersome for travelling with through the interior. They are carried by four men instead of two like the north canoe; and besides being capable of carrying twice as much cargo, are paddled by fourteen or sixteen men. Travellers from Canada to the interior generally change their canôtes de maitre for north canoes at Fort William before entering upon the intricate navigation throught which we had already passed; while those going from the interior to Canada change the small for the large canoe." pp. 287-8.

the land, timber and minerals. Therefore it is only since 1889, when the limits on the north and west were determined by Imperial Act, that settlers, lumbermen and mining prospectors have been sure of titles over a large extent of the region. And this is why it is called the New Ontario.

PHYSICAL ASPECTS OF THE COUNTRY.

The physical features of the country cannot be accurately described yet, because they are not sufficiently known. There is a height of land extending westward from the Quebec boundary as far as the 90th meridian, which forms the watershed between Hudson bay and the great lakes. There is another, running northward near the 90th meridian from the American boundary to the 50th parallel, and then turning north-westward between lake St. Joseph and lake Seul, enters Keewatin territory and reaches Hudson bay near the mouth of Nelson river.

The first of these watersheds to the north includes the basin of the Moose river, with its three large tributaries, the Abitibi, the Metagami and the Missinaibi; and a portion of the basin of the Albany river, with the Kenogami as its chief tributary from the Ontario side.

South of the watershed are numerous rivers flowing into the St. Lawrence system of waters, including the Montreal, which joins the Ottawa; the French, which drains lake Nipissing and its tributaries, and lake Wahnapitae through a river of the same name, into Georgian bay; the Whitefish, Spanish, Mississaga and Thessalon, into lake Huron; and a number of rivers into lake Superior, the largest of which are the Goulais, Michipicoten, White, Pic, Nipigon, and Kaministiquia.

The headquarters of those streams flowing north to Hudson bay and south to the great lakes often interlace each other, and there are a number of lakes on the tableland which discharge their waters both north and south. Shoal lake, northeast of lake Nipigon, is one of these. It is 300 feet above the level of lake Nipigon, to which it sends a contribution of its waters down the Ombabika river, and 1,200 feet above the level of the sea, to which an equal contribution is made through the channels of the Powitic and Albany rivers. "No portage occurs on the Ombabika for about nine miles before

reaching Shoal lake," Dr. Bell reports, "nor for nearly five miles beyond its northern outlet; so that we passed the height of land with the greatest possible ease, having had about seventeen miles of uninterrupted canoe navigation from the time we made the last portage on the southern side till we came to the first in going down on the northern."* Lake Temagami, which lies about thirty miles north of the west end of Lake Nipissing, is remarkable for having had at one time four outlets; but since its level has fallen the number is reduced to two—the Metabechawan river to the Ottawa, and the Sturgeon to lake Nipissing By these lakes along the northern divide and the streams which discharge their waters, Ontario is found to be cut up into a number of islands, the largest of which is the one we occupy.

The portion of the Province west of the north and south watershed, near the 90th meridian, lies within the basin of the Nelson river, which, next to that of the Mississippi, is the largest river basin on the continent. Lake Seul in the north, Rainy lake in the south, and Lake of the Woods in the west collect the Ontario waters of this basin to discharge them through Winnipeg river into the lake of that name, there to mingle with the waters of Red river from the highlands of Minnesota and of the Saskatchewan from the Rocky mountains, and be borne by the mighty Nelson into Hudson bay.

In the closing period of the glacial age, as the ice field slowly retreated towards the arctic circle, the region towards which those streams from the eastern, southern and western slopes converge became the bed of what was no doubt the largest fresh water lake ever formed upon this earth. Lake Agassiz, for that is the name by which it is now known, is traced as to its shore lines by well defined gravel and sand beaches from the height of land in Minnesota northward to the 55th parallel, and at least from Rainy lake, if not from lake Seul, west to the Souris river. The area of this lake is computed to have been 110,000 square miles, or about 15,000 square miles larger than the combined areas of the lakes Superior, Michigan, Huron, Erie and Ontario.† The valley of Rainy river, as well as the plains of Minnesota, Dakota and Manitoba, owe their fertility to the silt deposited in this ancient lake; and it is not unlikely that we owe to

* Geol. Sur. Can., 1871-2, p. 107.
† Warren Upham in Can. Geol. Sur., 1888-9, p. 11E.

its action also, to some extent, the deeply indented shore lines of Rainy lake and Lake of the Woods, which promise to aid in the development of the resources of the country bordering upon them by the facilities they offer to an extended navigation.

But like every country over which the glaciers moved, the whole north is a land of lakes, and so thoroughly is it threaded by streams running into and out of the labyrinth of lakes that the skilled woodsman with his canoe may steer his way in any course at his will. Many of the lakes, too, are of rare beauty, with clear blue waters and studded with lovely islands, of which Temagami, Crow, Shebandowan, Greenwater and Baril are fair types. Temagami lake, 600 feet, and Crow lake, 800 feet deep, are among the most picturesque in the world. Of rivers also there is an infinite variety, of all breadths and lengths and colors; and even in the same stream one may discover every shade of change. For miles together it may be level and placid as a stretch of canal. Then the rocky banks are seen to contract, the current becomes a rapid, and presently expands into a lake. Or there are shallows, a maze of channels through islets clothed with spruce or cedar, a terraced fall, a swirl of eddies, a rush of the foam-flecked flood between walls of rock, with the almost constant lakelet or lagoon in a setting of dark woods beyond, where in a margin of grass or reeds.

> The lotus lolls on the water,
> And opens its heart of gold,
> And over its broad leaf-pavement
> Never a ripple is rolled.*

And so the rounds of change go on through shifting scenes of quiet and turbulence. Such a river is the Seine, which, flowing out of Lac des Mille Lacs, carries down in its tortuous way to Rainy lake the overflow of a thousand other lakes besides. A canoe trip starting from Savanne on the Canadian Pacific Railway, traversing Lac des Mille Lacs, Baril, Brule, Windigoostigwan, Elbow and Crooked Pine Lakes, and thence down current on the Atik-okan and Seine rivers to Rainy lake, and on, if one is in the mood, across this lake to Fort Frances, down the Rainy river to Hungry Hall, and over Lake of the Woods to Rat Portage, where the Canadian Pacific Railway is

* From Cleopatra, by W. W. Story.

reached again,—this is an outing as replete with interest and exhilaration, and offers as much in the way of adventure as the heart of any lover of nature can desire. Especially so if it is taken late in the summer or early in the autumn, when the poplar woods are beginning to golden, and the mountain ash is laden with red-ripe clusters of berries, and the career of the pestilent black fly is over and gone for the season.

The information we possess of the Hudson Bay slope is practically limited to what has been seen along the rivers, for it is doubtful if any white man has yet crossed that country from east to west north of the 49th parallel. The general impression is that a large portion of the basin of Moose river is a treeless waste, covered with peat bogs, and not likely to have any agricultural value. But until more is known of it than any traveller or explorer has yet learned by canoeing up and down the chief rivers, with here and there an excursion of one or two miles into the timber out from their banks, it is useless to speculate on the future of this region.

The discovery of what appears to be a most valuable tract of country, on the Quebec side, east of the Moose river basin, has only been made known to us during the past year. By the explorations of Henry O'Sullivan, of the Crown Lands Department, Quebec, and of Dr. Robert Bell, of the Geological Survey, it has been ascertained that in the basin of the Nottaway river and its tributaries, the Waswanipi and the Mekiskan or Bell, there is a tract of rich and finely-timbered land as large in extent as the whole of England, of which nothing whatever was known two years ago. The description given of it in Mr. O'Sullivan's report, recently published, is intensely interesting to every Canadian, as well as to students of physical geography, and inspires us with the hope that regions of perhaps equal extent and value may be found in Ontario also, beyond the height of land. We shall only know by exploring for it, as has been done in Quebec. The Hudson's Bay Company, whose only interest is in the fur trade, we can depend will never tell us any good thing of the country which might have the effect of inviting the settler, the miner or the lumberman to disturb the haunts of the Indian trapper and hunter."*

* In the report of his explorations, dated 15th May, 1895, Mr. O'Sullivan says: "The general impression, formed no doubt from the experience

PHYSICAL CHARACTERISTICS AND NATURAL RESOURCES.

After the account already given of the Archæen rocks of the New Ontario, it is not necessary to write more than a few words on its geology. Belts of the Huronian system of rocks, running generally in a northeast and southwest direction overlie the Laurentians all the way from Lake of the Woods to the Ottawa river, and extend to the southern limits of the territory along the international boundary and the shores of lake Superior and lake Huron. What is known as the "great belt" of this system stretches from lake Superior north of lake Huron to lake Mistassini in Quebec, a length of about 700 miles. Around lake Superior there are Cambrian rocks (of the Animikie and Nipigon series) over the Huronian, and it is thought also that there is an area of Lower Cambrian north of lake Huron, in the basin of the Vermilion river, the length of which is thirty-six miles and the greatest breadth 8 miles. Around Sault Ste. Marie is a formation of red sandstone which is believed to be of Potsdam age; west and northwest of lake Temiscaming is an important area of Niagara limestones; while on the Hudson Bay slope, lying up over the Laurentian and Huronian rocks and extending from the eastern boundary of the Province westward beyond the Kenogami river, are several formations of the Silurian and Devonian systems, including the Niagara, Onondaga and Corniferous rocks. In the region southwest of James bay, Dr. Bell says, the Corniferous forma-

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of surveyors and explorers in this Province, was that all that northern region was a cold rocky waste, and certainly any one who would visit the head waters of any of our large rivers flowing into the St. Lawrence from the north would naturally be impressed with the feeling that there was little use in searching for anything worth having, excepting perhaps fish, game and minerals, any farther north, and I must confess that this was my own impression until last summer. On St. Jean Baptiste day, 24th June last (1894), the Reverend Father Gueguin said mass in my tent at the foot of lake Dumoine. That reverend gentleman has been missionary among the upper Ottawa and Hudson bay slope Indians for nearly thirty years. After mass, as we were descending the Dumoine river in company with Mr. L. A. Christopherson, Father Gueguin, in relating some of his experience among the Indians, told me of having seen some good land and large timber in the neighborhood of lake Waswanipi, and strongly advised me to try and explore that country. Mr. Christopherson, guardian of the Hudson Bay Company's post at Grand Lake Victoria for the last twenty years, was of a different opinion. He said that he did not think there was anything worth having beyond the height of land. To use his own words: "The interior Indians who visited the post could not get an axe-handle there.'" This is in keeping with the traditional policy of the Hudson's Bay Company.

tion occupies an area larger than all the western peninsula of Ontario.

Of all the natural resources of the New Ontario the forest is the one of most obvious value, for there is nothing to hide or obscure it. There are yet wide tracts of pine land, although many square miles have been cut over by the lumberman and more have been swept and destroyed by fire. It seems likely that most of the country now covered with poplar was one time under pine. West of Port Arthur the pine forest was burnt over within the memory of men yet living. In his Narrative of the Red River Expedition of 1857 Prof. Hind says he found extensive areas covered with burnt forest trees, chiefly of pine, in the valley of the Kaministiquia river as far as Little Dog lake, where the formidable barrier of Great Dog lake comes into view. On Dog river he observed wide areas strewed with the blackened trunks of trees; and in the young forest which seemed fresh and green at a distance, "the ground was found to sustain the charred remains of what had once been a far more vigorous vegetation."*

And of the country beyond Lac des Mille Lacs he writes: At Brulé portage [between Baril and Brulé lakes] I ascended a steep hill bordering a small rapid stream called Brulé river, and from an altitude of fully 200 feet had a fine view of the surrounding country. The vegetation upon the hillside and summit was truly astonishing, and the term Brulé portage received an unexpected interpretation on finding hidden by a rich profusion of brushwood the dead trunks of many noble pines. Throughout the day the tall trunks of white pine, branchless and dead, rising in clumps or in single loneliness far above the forest, had attracted attention, and on the side of the Brulé hill we observed many prostrate half-burnt trees of the largest size. One dead trunk was measured and found to be twelve feet in circumference five feet from the ground. A living tree, tall, clean and apparently quite sound, measured nearly ten feet in circumference, and many of the prostrate pines were of equal dimensions. There can be little doubt that these were the remains of a magnificent white pine forest, which formerly extended over a vast area in this region, since from the summit of the hill the forms of scattered

* Vol. I., p. 49.

living trees, or tall branchless and scathed trunks met the eye in every direction. The young second growth indicated a soil not incapable of sustaining pine trees of the largest proportions; black cherry, birch (both white and black), alder, small clumps of sugar maple, and a thick undergrowth of hazelnut now occupies the domain of the ancient forest. The southwest side of this hill formed a precipitous escarpment 150 feet above the waters of a long, clear lake. All around the eye rested upon low dome-shaped hills dipping towards the northeast and covered with a rich profusion of second growth. The vast wilderness of green was studded with black islands of burnt pine, and a few isolated living trees, serving by their surprising dimensions to tell of the splendid forests which must have once covered the country. . . . The uniform size of second growth timber on the Brulé hill seemed to prove that the great fire which devastated this region may have occurred about thirty years since.* That would be about seventy years ago. Another fire which destroyed a valuable pine forest occurred about twenty-five years ago in what is now known as the Sudbury country, north of lake Huron. It is said that in one day this fire ravaged a tract seventy miles long by thirty wide, or in all about 2,000 square miles.†

* Vol. 1, pp. 63-64.

† The first fire in this region occurred in 1864, and extended from lake Nipissing to Bruce Mines along the shores of Georgian bay and lake Huron. The fire of 1871 followed in the wake of the previous one, but covered a much larger area in the interior. Mr. D. F. Macdonald of Parry Sound, who knows the region intimately, writes me: "The hardwood ridges and dense swamps seemed to be the only effective barriers of the conflagration. Lakes and rivers made no break in the fiery torrent as it rushed along the pine-clad and moss-covered ridges of rock and sandy or gravelled plains. The fire of 1871 was doubtless the fiercest, as it destroyed every tree and plant in its course, as well as animals. I found the charred bones of an Indian on the Wahnapitæ river in the autumn of 1872, and no doubt he had been smothered in the smoke and flames. The burnt barrel of his gun, his hatchet, knife and kettle, with the metallic buttons of his clothes and a few wrought iron nails from the canoe, were all commingled with his charred bones. This shows that the fire was heavy and hot when an Indian would become a victim to its ferocity. Had he followed the river he would have been swept over the falls; he ran the fiery gauntlet about half way across the portage with the canoe on his shoulders, when he fell smothered with smoke and heat and was cremated on the spot. Both fires originated in the neighborhood of lake Nipissing, and in 1871 there were no persons on that lake except John Beatty at the mouth of South river, and Norman McLeod, the Hudson's Bay trader, near the mouth of the Sturgeon, and a few Indians on the Beaucage reserve, on Goulas point, and at Chaudierre falls." The fire in 1864 took place in the first week in May, Mr. Samuel A. Marks of Bruce Mines informs me. Only five houses were saved in the Copper Bay section of the village, and about 1,500 people were left homeless.

The same region, Indian tradition says, was burnt over about one hundred and thirty years ago. Indeed it is very probable that successive forests have grown up and have perished in the flames in past milleniums, since the land became fitted for the sustaining of tree life upon it. Hitherto little use has been made of timber other than pine, of which there are immense areas in the New Ontario; but it is certain to find a market, and the Province will yet derive a large revenue from it. Even now there is an active demand for poplar and spruce for the manufacture of pulp, and this is fast becoming an industry of great magnitude. As for the future, one hardly dares trust himself to forecast what our needs may be a century or a quarter of a century hence, for the wit of man is seeking out many inventions. But in all human probability we shall never be able to find a complete substitute for wood in the arts; and it is not too early now for adopting schemes to conserve our forests. There are many parts of the north so rough and rocky as not to possess any prospective value for agriculture, but suitable enough for forest growth. What better policy can be chosen as regards such tracts than to set them apart in perpetuity as Crown forests? This is a simple plan, and it possesses the merit of being well started already, in the sense that Nature has planted the trees and prospered their growth under its own conditions.

As an agricultural country, there is much to be said for the north. It is true, as just stated, that many parts are too rough and rocky for tillage; but other parts are as full of promise as any of our older counties. This is especially true of the river valleys north of lake Huron, where the soil is wonderfully productive. And there are many other areas of equal excellence, such for example as the regions around lake Tamiscaming (where twenty-five townships embracing 575,000 acres are surveyed), to the north and west of lake Nipissing, and in the valley of the Vermillion river. For the growth of peas and oats, timothy and clover, and root crops of all kinds, there is no more suitable land anywhere than in those districts; and they are equally well adapted for the dairy industry and the production of beef and mutton, as the pastures are nourishing and water abounds everywhere. Beyond Port Arthur and Fort William there are many good farms, and on the Wabigoon river, 200 miles from Fort William, there is a tract of land now being opened for

settlement, where the Ontario Government has already established a dairy farm, which promises remarkably well. No doubt many other regions of fertile land exist throughout our northern domain; but of those that are well known it may be safe to say that the largest and best is the country on the Rainy river lying between Rainy lake and the Lake of the Woods. Writing of this district and the river itself in his Narrative of a Journey round the World, Governor Simpson of the Hudson's Bay Company said: "From Fort Francis downwards a stretch of nearly a hundred miles, it is not interrupted by a single impediment, while yet the current is not strong enough naturally to retard an ascending traveller. Nor are the banks less favorable to agriculture than the waters themselves to navigation, resembling in some measure those of the Thames near Richmond. From the very brink of the river there rises a gentle slope of green sward, crowned in many places with a plentiful growth of birch, poplar, beech, elm and oak. Is it too much for the eye of philanthrophy to discover, through the vista of futurity, this noble stream, connecting as it does the fertile shores of two spacious lakes, with crowded steamboats on its bosom, and populuous towns on its borders.* This is a glowing description for a Hudson's Bay officer to give; but Governor Simpson recanted it with ingenuity when the claims of his company seemed to be in jeopardy before a committee of the Imperial House of Commons a few years afterwards. When the passage from his book was read to him, first by Mr. Gordon and subsequently by Mr. Roebuck, Governor Simpson said he only meant the description to apply to the bank, "the lip of the river" as he phrased it. "The back country is a deep morass, and never can be drained in my opinion." And again: "I confine myself to the banks; the back country is one deep morass extending for miles." The Governor's explanation was ingenious in a little sense, but it had the demerit of being untrue. The fertile land along the Rainy river on the Ontario side extends nearly from one lake to the other, a distance of about eighty miles, and its breadth is said to range from five to twenty-five miles. The land also rises steadily towards the north, so that drainage is easy; indeed the swampy ground a mile back from the river is found by levels to be seventy feet above it. The soil is deep and

*Narrative of a Journey Round the World during the years 1841 and 1842, vol. I., pp. 45-6.

rich, and the climate is favorable for the maturing of almost every kind of cereal grown in lower Ontario. Ballantyne, who ascended the river on his way from Norway House to Montreal, as previously noted, has given us his impressions of it in a book published long after he had left the service of the Hudson's Bay Company. "Next morning (September 11, 1845) we commenced," he writes, "the ascent of Lac la Pluie river. This is decidedly the most beautiful river we have yet traversed—not only on account of the luxuriant foliage of every hue with which its noble banks are covered, but chiefly from the resemblance it bears in many places to the scenery of England, recalling to mind the grassy lawns and verdant banks of Britain's streams, and transporting the beholder from the wild scenes of the western world to his native home. The trees along its banks were larger and more varied than any we had hitherto seen—ash, poplar, cedar, red and white pines, oak and birch being abundant, whilst flowers of gaudy hues enhanced the beauty of the scene."* This is almost a true picture, but settlement now extends along many miles of the river on the Ontario side, and to some extent at least the forms of natural beauty have been changed and marred. The description however is remarkably faithful of the Minnesota side, where, except for glades with wide-branching elms and a few gaps cut by squatters, the banks are yet clothed with the primeval forest."†

* B. M. Ballantyne's Hudson's Bay, p. 272.

† In his Voyages from Montreal, p. lvi, Sir Alexander Mackenzie says of the Rainy river and the country along its banks: "This is one of the finest rivers in the Northwest, and runs a course west and east one hundred and twenty computed miles; but in taking its course and distance minutely I make it only eighty. Its banks are covered with a rich soil, particularly to the north, which, in many parts, are clothed with fine open groves of oak, the maple, the pine, and the cedar. The southern bank is not so elevated, and displays the maple, the white birch and the cedar, with the spruce, the alder, and various underwood. Its waters abound in fish, particularly the sturgeon, which the natives both spear and take with drag-nets. But notwithstanding the promise of this soil, the Indians do not attend to its cultivation, though they are not ignorant of the common process, and are fond of the Indian corn, when they get it from us. Though the soil at the foot is a stiff clay, there is a garden, which, unassisted as it is by manure, or any particular attention, is tolerably productive." Dr. Bigsby, who went down the Rainy river in 1823, makes this reference to it in his book—Shoe and Canoe: "A thousand years ago, while yet our England was a wolfish den, the silver Trent of the midland counties must have greatly resembled the Lapluie of the present day. I am not sure that the fur trader, an Italian perhaps, had not a hut on its banks; but certainly at the time we are speaking of both these streams flowed smoothly and freely in a successions of lovely and sequestered reaches, and through terraced meadows, alternating with rich woods and reedy marshes. The Lapluie seems made for a pleasure excursion; all is serenity and beauty." Vol. II., p. 270.

But the best hopes for the New Ontario are no doubt built upon its mineral wealth, the extent and value of which we are only beginning to realize. The rocks of the Huronian and Cambrian systems are found to be mineral-bearing over a wide extent; and from the number of discoveries made every year in new and unexpected localities, we have an assurance that as yet only a little of this hidden treasure has come to be known. In the Animikie slates of the Cambrian system silver mines have been worked at points far apart, some of which have proved to be very rich. Silver Islet alone has yielded upwards of $3,000,000. In the Nipigon rocks of the same system native copper and copper sulphide have been discovered at many places, but notably on Michipicoten island and point Mamanise, where the occurrences are the same as on Keweenaw point on the south shore. But too much of the exploratory work hitherto has been extravagantly done, both on the island and the mainland. As an illustration, it may be stated that the Quebec Mining Company in 1848-50 expended at Point of Mines $232,256, chiefly above ground, before any quantity of ore was raised on the lodes were proved to be valuable. A village of fifty or sixty houses was built for miners and other employes, besides offices, stores, magazines and a sawmill. Inspector William Gibbard, who visited the location in 1860, reported that he found smelting works, crushing mills, jigging works, stamp forges, railroads, hundreds of yards of iron chain, ladders, furnaces, scows, etc., in a dilapidated state, thousands of fire brick, and an expensive conduit about one mile long made to convey water to the stamps.* This was an expenditure preparatory to mining, before it had been proven that there was more than a surface show of ore; and the capital being thus wasted the company was left without means to carry on the actual work of mining or establish the value of their property by sinking deep shafts upon the veins.† It is however in

* Report of the Commissioner of Crown Lands of Canada for 1860, p. 90.

† In 1767 and 1768 the east shore of lake Superior was explored by Alexander Henry and copper was discovered at a number of points from Mamainse headland to Michipicoten harbor, which was called by the Indians the coast of Nanibojou. In the spring of 1768 Mr. Henry met Alexander Baxter, his partner, to whom he communicated the information of his discoveries, and measures were taken for working the mines. In 1770 Mr. Baxter returned from England, bringing with him papers by which, with Mr. Bostwick and himself, Mr. Henry was constituted a joint agent and partner

the Huronian system of rocks that the greatest variety of minerals is to be found. Ores of copper, nickle, iron, gold and other metals have been discovered, and operations are carried on which promise to establish a large industry. At the Bruce and Wellington mines, north of Lake Huron, copper mining was carried on for about 27 years, ending with 1875, and the value of the output in that time is reported to have been as much as $7,000,000. At the Sudbury mines, the ores of which yield nickle, copper and some cobalt, the total ore output of the mines for the six years 1890-95 was 539,936 tons, of which there was smelted and reduced to matte in the furnaces 430,539 tons. For five years 1891-95 this industry paid for labor at the mines and works the large sum of $1,436,216; and the value of the products of nickel, copper and cobalt for the four years 1892-5, computed at the selling price at the furnaces, was $2,781,800, or an average of $695,450

for working the mines. They passed the winter together at Sault Ste. Marie and built a barge fit for the navigation of the lake, besides laying the keel of a sloop of forty tons. In May, 1771, they went to explore the island of Yellow Sands (Caribou island) where they hoped to find gold, but a stay of three days did not enable them "to find gold nor even yellow sands." On the fourth day they sailed to the east shore, examined the coast of Nanibojou where they found several veins of copper and lead, and returned to Point aux Pins, where they erected an air furnace. The assayer made a report on the ores, stating that the lead ore contained silver in the proportion of forty ounces to the ton, and the copper ore only in very small proportion. The rest of the season and the following winter and spring were passed in exploring and mining at Ontonagon on the south shore; but in June the whole establishment of miners returned to Sault Ste. Marie. "In the following month of August," Henry records, "we launched our sloop, and carried the miners to the vein of copper ore on the north side of the lake. Little was done during the winter; but, by dint of labor performed between the commencement of the spring of 1773 and the ensuing month of September, they penetrated thirty feet into the solid rock. The rock was blasted with great difficulty; and the vein, which at the beginning, was of the breadth of four feet had in the progress contracted into four inches. Under these circumstances we desisted and carried the miners back to the Sault. What copper ore we had collected, we sent to England; but the next season we were informed that the partners there declined entering into further expenses. In the interim, we had carried the miners along the north shore as far as the river Pic, making, however, no discovery of importance. This year therefore, 1774, Mr. Baxter disposed of the sloop and other effects of the company, and paid its debts. The partners in England were his Royal Highness the Duke of Gloucester, Mr. Secretary Townshend, Sir Samuel Tutchet, baronet, Mr. Baxter, counsel of the Empress of Russia, and Mr. Cruickshank; in America, Sir William Johnson, baronet, Mr. Bostwick, Mr. Baxter and myself. A charter had been petitioned for and obtained; but, owing to our ill success it was never taken from the seal office." Travels and Adventures in Canada, by Alexander Henry, pp. 234-5. This was no doubt the earliest attempt at mining made on the Canadian shore of lake Superior.

a year. Iron ore has been found in many localities in the Huronian formations, but the largest and most valuable deposits are believed to be the hematites of the Mattawan river range and the magnetites of the Atik-okan. Both these are of immense extent; in fact the ore is in mountainous bodies, and millions of tons could be mined as in an open quarry. But for the present they lie far from railways, and the home market is only opening. Gold however is found more generally than any of the other metals. It has been discovered in the Sudbury district, in the townships along the valley of the Thessalon river, on the north shore of lake Superior, and in many places throughout that part of the Province which lies within the basin of Nelson river. This latter district embraces Lake of the Woods and Rainy lake and the territory drained by their tributary rivers, as well as a portion of the slope drained by the English river, and is 200 miles long by 100 broad. The discoveries made here within the last three years have raised great expectations, and some of the properties upon which development work has been done are confidently asserted to be rich and valuable. There are now six stamp mills in that country for treating gold ore, with an aggregate capacity of sixty stamps, and more are likely to go up this year if the needed capital is got. Those northern gold fields are certainly as well deserving of the attention of miners and capitalists as many in the United States, in Russia, or in Australia. But the production of bullion in large and paying quantities seems to be needed to establish confidence in them, and this work remains to be done.

GENERAL CONCLUSIONS.

Enough has been said of the New Ontario as regards its extent, its physical characteristics and natural resoures to prove that it is an important possession; and it is humbling to our pride as men of an enterprising and progressive race to confess that so little has been done to occupy and utilize it. Fifteen years ago (in 1881) it had seven organized municipalities, with a population as taken by the assessors of 4,765. In 1895 it had forty-eight municipalities, and a population of 36,000. This is some progress, but it ought to be far more. There are more men leaving our Province every year than is represented by the increase of these fourteen years, and it may well be doubted if they have gone to a better country for improving their

circumstances. The two things most needed to open up the New Ontario are population and capital. British capital and emigration are turned towards the United States, in many parts of which a British citizen cannot hold a foot of ground in his own name; and towards the Transvaal, where he has no civil rights, and pays the great bulk of the taxes without even the privilege of educating his children in the schools in his own tongue. He could depend on getting fair treatment and the security and all the rights of citizenship if he came to the New Ontario instead, and he might find there scope for all his energies.

But it is an old saying that the gods help those who help themselves. If we take a proper interest in the north country ourselves we may do much to turn it to a good account. We do not lack for men or capital. Our men in far too large numbers cross over to the United States to swell the population of that country. Much of our capital is in the banks. The official statement for the month ending 31st December last shows that there was deposited by the public in the chartered banks of Canada the very large sum of $187,119,573, whereof $119,667,176 is presumably drawing a low rate of interest, it may be 3 or possibly 3½ per cent, while $67,452,397 is at call, drawing none. There must be openings in the New Ontario for investing a portion of this capital with a chance of realizing good profits; and every investment of this nature THERE is patriotism, as well as enterprise and pluck; by which I mean a real investment, where there is some risk of loss as well as of gain, not a loan upon a gilt-edged mortgage. Ought not the policy to be, That we ourselves possess the land and win its wealth?

CHINA, PAST AND FUTURE.

Read before the Hamilton Association, Nov. 7th, 1895.

BY S. A. MORGAN, B. A.

It has been said that the family precedes the nation, as the individual does the family. While this may be physically true, as regards the first stages of national life, we find the very opposite to hold good in the relationship existing between the individual and the nation in the more advanced stages of civilization. Like the individual, the nation which is truly national is a living and unified organism. It lives not to itself alone, but moves ever on, guided by some spiritual impulse to the realization of its mission to humanity. To partake, therefore, of national life it is not sufficient simply to set our dwelling place within certain geographical limits or to trace our lineage through certain ancestral lines. That man is truly a citizen who finds fixed in his own breast these impulses which give character and permanence to the nation, and who in his own life gives expression and development to the same. Instead, then, of the individual being above the nation, the individual will ever be found to inherit from the nation whatever he possesses of intellectual and moral permanence in his character.

In what, then, may national life be said to consist? National life finds its source in the establishment of certain civic ideals as universal motives among any number of individuals. To develop the nation is to develop the individual in and through these national traditions; to unify and solidify the nation is to give these ideals such an environment as will enable them to develop in every direction.

This being true, how are we to pursue our investigations into the nature and progress of individual nations? Not by devoting our whole attention to the idiosyncrasies of particular individuals, but by establishing the sources and relative values of the living forces, physi-

cal, intellectual, and moral, by which the nation is inspired in its onward progress; by perceiving what in them is of universal truth and beauty, what partakes of falsehood and decay.

In our conceptions of the relative importance of nations as in those of individuals we are too prone to be swayed by utilitarian considerations, and to attribute to physical conditions phenomena which often carry a far more spiritual signification. In the nation, no less than in the individual, heroic actions will ever be found to proceed from nobility of thought, while thought itself must draw inspiration from lofty ideas and sentiments. To rightly understand the main springs of national life it is not alone nor chiefly necessary to investigate is external or physical conditions. These, it is true, have their part to play, but a more essential explanation of the spiritual force of a nation is to be found in her prevailing sentiments of beauty and goodness, as found crystalized in the nation's religion, literature, art, philosophy, and social life.

This fact can be established by numerous illustrations. It is the ancient classical world, whose religion pictured gods in the form of heroes and made virtue synonymous with valour, that has given the world its greatest examples of heroic action. In the case of our own land, we know that our national life really dates from the time when that heroic band of men, sacrificing the labors of the past, began life anew amid the forests of Upper Canada for the sake of Britain and British institutions. To-day the guiding star of our national life is to repeat in the new world the glory of the motherland, to establish here a second fountain head of British faith, enterprise, valour and piety. Such is the well-spring of our national life and we may be assured that all dreams of Americanization and French republics will prove as visionary as the political success of those who propagate them. Again, at our very door, we have a nation whose birth throes were the expression of a demand for individual liberty, and to such an extent has this ideal insinuated itself into the fibre of the nation, that in this short time it has more than once threatened by its intensity the solidarity of that which it should cement.

But humanity is broader than the nation. "Her destiny will on the way it takes, cracking ten thousand curbs asunder." For national life, then, to be permanent, it is not alone sufficient that

these national impulses should permeate and guide a community of minds. They must also play their part in the wider field of human progress. Here they must hold their own in the clash with other systems, and happy is that nation which finds its own ruling sentiments harmonizing with the onward march of humanity.

Having premised so much in regard to the nature of national life, and the proper method to be pursued in its investigation, I trust it will not be necessary to offer anything by way of excuse, for the point of view from which we are to conduct our investigations this evening. We have before us not only the most ancient, but in many respects the most remarkable example of national life to be found in the pages of human history. A nation compared with whose life the life of surrounding nations has been as the generation of leaves. A nation which three centuries before the great Athenian sages reasoned on life and human destiny, and six centuries before the meek Galilean teacher brought to mankind his message of love, was able to produce a philosopher who, guided (shall I say?) by the light of reason alone, was able to give forth for the direction of his fellow man, "Do not unto others what ye would not that they should do unto you."

Venerable in age, it also presents phenomena unheard of in the history of western nations. Nor is its importance to be measured solely by the interest of the past. Having striven for ages, shut up in the isolation of its own being, to work out its individual mission, it must now yield itself to the influence of a wider destiny. As to the probable results of this movement it is our purpose briefly to speculate this evening.

It has already been laid down that national life study should consist in a study of these subjective or spiritual impulses which find expression in the nation's life and character. In the nation no less than in the individual, mind is above matter. Here only can they develop themselves with a reasonable freedom of movement; from this everything of a more material nature will be found to receive its coloring.

There are always three aspects under which the Philosophy or spirit life of a nation may be viewed: Thought in its relationship to the universal—Religion; thought in its relationship to the individual—Sociology or Ethics; thought in its relationship to nature—

Science and Art. Of these three, the former, thought in its relationship to the universal, may be said to be above, and in a certain sense to direct the course of the other two. In fact so true is this of some nations (e. g. the one before us) that we find it impossible to distinguish clearly between the two, religion and ethics or morality.

Ethical writers distinguish three sources of ground work upon which the social morality of a people may rest: rational ethics, based on the nature of necessary thought; theological ethics, on the revealed will of God; emperical ethics, on observation and induction.

While Chinese morality may, in some of its aspects, be said to fall under the third phase, yet to such an extent has their ethical life been influenced by their conception of the nature of the deity that we shall best understand the nature and relationship of the whole by approaching their social and practical life from the religious side.

The religious life of the Chinese, in some of its respects, may be said to be unique. They are credited with being the possessors of three systems of religion which may be termed national, and which for centuries have lived peaceably side by side; and to-day it is no uncommon thing to find the same person boasting himself an adherent of all three of the national systems. This, at first sight, might seem to argue much for the religious toleration of the people, but its true explanation lies elsewhere. It is to be explained partly by the fact that these systems in a manner supplement one another, partly in the fact that they have each been in a manner identified with the state administration, but more largely by the fact that they all have been made to rest on and harmonize with a more primitive form of nature worship and ancestral idolatry.

Of the three so called religions of China only two, Taouism and Buddhism, are properly religious systems. The third, Confucianism, is rather a system of imperial ethics, but founded in harmony with the religious conceptions of the nation.

The influence which any religious system will exert over the life and actions of its adherents will be found to differ according to the conceptions which it forms of the universal.

In general, all religions may be divided into two classes under this head. Subjective religion, in which the deity as pure spirit and

free personality is attributed with unlimited power. Objective religion, where the divinity as an unspiritual nature being is conceived as limited and subordinated to an unchanging and eternal world order.

The general effect of these two opposite phases of religious thought will be readily apparent. The former, with its free personality and high conception of divine power, will equally emphasize the personality and moral activity of the individual, and there will arise a consequent dissatisfaction with the present natural state. The second, with its contradiction of free personality in the divine, will be wanting in moral activity and individuality, and tend rather to a uniform submission to the natural world order, as found in man and the outer world, personality thus becoming passive and obedience the highest virtue.

We stated a few moments ago that the apparent toleration of the various systems of religion in China was explained chiefly by the fact that they all rested on a primitive form of nature worship. In this system heaven and earth are set forth as the Great Father and Mother of the universe. By heaven, however, is meant but the pure physical ether, which first spontaneously organized itself out of chaos; while earth represents the coarser and heavier elements. These two, representing the male and female elements in nature, produced the seasons, and these latter the products of the earth.

The adoration of heaven and earth, as the parents of all things, forms the life centre of the whole of China's religious thought; and to this day the most solemn religious ceremony in the national worship is to be seen when, twice each year, the Emperor, as the high priest of China, enters the Temple of Heaven at Peking to offer up his devotions for a propitious year.

On this conception of nature rests that remarkable ceremony which may be called the real religion of China, ancestral worship. When the ancient worship treats its chief god, heaven, as the male principle, and relates it to earth as the female element, we can see that two opposite conceptions are likely to arise in the national mind. First, the corresponding physical relationship of husband and wife is prone, by its similarity to the national religion, to be to a certain extent deified. Second, religion itself, by its resemblance to the common place of every day life, will tend to become rational and material, the practical will tend to overshadow the spiritual.

The first of these tendencies resulted, in a remote age of Chinese civilization, in that form of worship known as ancestral idolatry. Acting at first as a tendency to elevate the parental relationship, and establish filial piety as the highest duty, the spiritual conception soon found itself overtaken by this child of morality; for looking upon the father and the mother of the family as types of the great father and mother of the universe, they soon carried filial piety into the sphere of religious belief, where it became established as ancestral worship, which is simply piety extended beyond the grave. A further explanation of this custom lies in their conception of the human soul. This is supposed to possess a threefold division, one of which at death enters Hades, one the grave, and the third of which lingers about the ancestral home. The last two of these must be provided for by the descendants, and if neglected are wont to punish their unfilial offspring. The offerings of the living, to be acceptable, must be presented by a male descendant; and, with the exception of food, since they are for the spirits of an invisible world, must be rendered invisible by burning.

To enter into a long description of the minute particulars of ancestral worship would be beyond the scope of the present paper. A few thoughts as to its general effect must suffice. While ancestral worship may seem, in its first conception, to have rested on a foundation of love, there can be no doubt that fear is now the motive power. To make the dead dependent on the living for their happiness, and to endow them with power to inflict punishment when neglected, is to chain hopelessly the living present to a dead past. Two duties are ever present to the devout Chinaman, to provide for the comfort of his ancestors, and to leave behind him a line of male descendants who shall perform a like duty for him. Such a system must tend to root a people perpetually to their existing environment. All progress will be considered a dangerous innovation, and a colonizing spirit the most sacriligious impiety. No wonder that such a people should be remarkable for the absence of a critical and scientific spirit.

But while we note the defects of the system, its advantages should not be overlooked. It renders sacred and secure, internally, the home and the nation. As the Emperor must reign in order to perform the requisite rites for securing the favor of Heaven and

earth, so the family must be held together, that no break may occur in the ancestral worship. Whether these benefits are adequate from the broad standpoint of humanity to counterbalance the serious defects of the system, is doubtful indeed.

Let us next notice what additional elements have been introduced into the religious fibre of the nation by the three so-called national religious systems.

CONFUCIANISM.

As has already been mentioned, Confucianism is in no way concerned with the supernatural, and indeed lay no claim to such. We noted above, in describing the conception of the Chinese concerning their nature god as male and female, the likelihood of religion itself becoming humanized. Confucianism is but the realization of this on the practical or ethical side, and represents an attempt to solve the mystery of life by the use of the intellect alone.

To say that China does not owe much to Confucianism would be grossly unjust. A system which rests on a belief in the dignity of human nature cannot but appeal to humanity, and perhaps there is no nation among whom outward politeness, love of peace, and a fixed mode of living are so firmly established. But like every human institution, this one also has its inherent defect. From the days of Confucius to the present intellect has ever failed to control habit, unless resting on some higher spiritual ideal. And to-day there is perhaps no nation where is to be found such remarkable combinations of external politeness and inner dishonesty as may be found among the modern disciples of Confucius.

TAOISM.

If Confucianism is the result of the humanizing of the primitive religion, Taoism may justly be said to represent the same in a materialized form. We have seen how, in the Confucian philosophy, man was made the measure of all things, and social duty the only rule of action. But man, however much you may direct his thoughts to the facts of this life, cannot wholly deny his spiritual nature. The question, "Whence came I?" will make itself felt, and direct the spirit of man to find some object of worship, some superior being to control its destiny. This craving of the human spirit Taoism undertook to satisfy. The very conditions, however, under which the

system originated could result in nothing but the elaboration of a vast medley of superstitions.

Starting from the conception that divinity is but an essence of matter, this religion, among a people so little endowed with the scientific spirit, soon found in the invisible agencies of nature the immediate presence of deity. Taoism thus in time developed into an elaborate system of superstitious idolatry, busied only with the evils of the present life. Such a religion could only result in weaving around the daily life of the people a web of superstitious notions, and letting loose upon its unhappy adherents a host of dread spirits until the very breath of the air becomes the voice of a demon. Thus the Chinese are to-day the most superstitious of nations, and it is no uncommon thing to find matters of the utmost importance, public and private, decided by some chance whim.

BUDDHISM.

Buddhism, the third great religion of China, is not a native of that country. Originating in India, where it was almost exterminated by persecution, it then made its way into China; and, after a struggle of a few centuries, found itself holding at least a second position in the religious favor of the people. To give anything like a full account of the circumstances connected with the introduction of the new religion would carry us beyond the scope of the present paper. Our purpose is solely to discover what influence it has exerted, and still is exerting, on Chinese belief and character. For this, a brief outline of the main phases of the system must suffice. Perhaps no better means could be adopted for showing the central thought of Buddhism than the quoting of a few typical thoughts from Indian philosophy which represent the true spirit from which Buddhism arose.

> "One hundred years is the appointed span
> Of human life; one half of this goes by
> In sleep and night; one half the other half
> In childhood and old age; the rest is passed
> In sickness, separation, pain and service,
> How can a human being find delight
> In such a life, vain as a watery bubble?"

Or again:

> "One course alone is proof against alarm,
> Renounce the world and safety shall be won."

From this it may be seen that Buddhism is but another name for pessimism of life and asceticism. Its object is to remove the misery resulting not only from bodily action but also from false knowledge. This view of human life is arrived at by the Buddhist from the following reasoning: As birth is necessarily followed by age, misery, and death, this individual existence can be only an expression of misfortune or punishment. If such, then life must have had some previous existence whose condition was responsible for the misery suffered by the individual in the present life. Thus the Buddhist has a remarkable chain of reasoning by which, from the basis of ignorance, he traces the conscious individuality of this life; from individuality, birth; from birth, decay; and from decay, death.

But, recognizing this life as a life of retribution only, the Buddhist at once must claim for all forms of earthly life a previous existence. This leads to the doctrine of transmigration, the great central principle of the Buddhist faith. Personal life is but the revolution of a wheel, which carries us from the present life into the unseen world, and vice versa. To this wheel all individual existence, whether of this or the unseen world, is bound, and its ceaseless revolutions are but the expression of the various rewards and punishments incident to personal existence. To teach man how to escape from this wheel of life and death is the object of the Buddhist faith. To do this we must lose our personal identity, must enter a state where thought shall cease to be our thought, and where life shall, as it were, cease to live,—a state without condition and without attribute. This state is the Nirvana, or the real heaven of Buddhism. Situated without the revolution of the wheel of personal existence, it contains only what is permanent and enduring. To arrive at this the soul must renounce the world of the flesh and purify itself by constant meditation, the real saviour of the system.

From this it may be seen that the basis of this doctrine is metaphysical and transcendental.

Although the speculative philosophy of the Buddhists, in its introduction into Chinese life, suffered much from its contact with the materialism of Chinese thought, still the benefits which it has conferred on the national character are great and most apparent. Both the native forms of belief had busied themselves only with the physical, the practical and the seen. No account was taken of these

obstinate questionings concerning the unseen world, which will arise in the heart of man. Even Taoism, while it affected a form of religious devotion, was tied to the ills of physical existence. Buddhism alone has given to the people whatever they possess of religious speculation. To its Heart of Pity, which sees in every sentient being the manifestation of an immaterial and immortal existence, must be attributed the humility, politeness and charitable disposition for which the Chinese are justly praised.

But, great as have been these benefits, they have not been purchased without cost. To purchase real happiness at the price of individuality, as in the Buddist Nirvana, and to view the present life as a stage of retribution for the sins of a previous existence, is to extinguish all energy and personality from the character of a people already too void of spiritual activity.

Such are the leading phases of thought which for centuries have been solidifying the Chinese national mind, and which have resulted in ingraining the following tendencies in the national character:

1. Fatalism in the practical affairs of life.
2. Impersonality in the intellectual life.
3. Lack of imagination in the emotional life.

Volumes might be written to illustrate how the Chinaman feels himself hemmed in, and his free personality limited by his environment. But a single illustration must suffice, the superstition termed *feng shui*, or wind or water. By these are meant certain spiritual forces which are supposed to belong to and influence every locality relative to its occupants. So fixed is this idea that it is no uncommon thing to find one neighbor taking proceedings against his fellow for having influenced for evil the local spirits. For instance, Mr. Halcombe relates a circumstance in which a certain American official was prevented from erecting chimneys on his residence for fear of disturbing the local genii.

The impersonality of the intellectual life of the Chinese is visible in every department of thought. The very language furnishes a perpetual illustration, by the depreciative terms which are used in speaking of the first person, in fact in many of the dialects there is a lack of any definite term for the ego or first person. Again in their poetry the absence of personification is a marked characteristic. In their fine arts the same feature is perceptible. Chinese painting

devotes itself chiefly to landscape, while sculpture busies itself with the production of huge images or grotesque figures.

But in no place, perhaps, is the evil effect of the absence of a high and active spiritual ideal more apparent among the Chinese than in their emotional life. Imagination, that mother of all spiritual beauty and human progress, may be said to be absent from the national character. This is in no place more apparent than in the utter absence of the scientific spirit. Both fine and mechanical arts the Chinese have had from remote antiquity, but in no department do they pass beyond the stage of copyist. To search for general principles, to pass from the particular to the universal is a stretch of imagination too great for the meagre philosophic spirit of the ordinary Chinaman.

Unsatisfactory as these leading national traits of character may seem from the western standpoint, we must not forget that they have not been without their accompanying compensation. It is to this very lack of personality, this dread of change in thought and environment, this bringing down of the divine to the level of every day life, that has enabled the nation to conserve itself throughout the centuries in spite of extortion and injustice in its government, and extreme poverty and wretchedness among its people.

But that such a state can much longer continue seems strongly improbable. We have seen that a time will come in the history of every nation when she must adjust herself to the progressive conditions of humanity. The onward wave of western life and thought is already forcing itself through the shattered wall of Chinese isolation. Can we, from the light of past history, form any conceptions as to the probable results?

First, there is always the possibility of the nation rising to the requirements of its new environment, and working out its own salvation by means of its inherent energy. That such a result will happen in the case of this people seems strongly improbable. The Chinese nation presents in a most intensified form the disadvantages associated with a too close relationship between government and religious belief. Every disturbance, therefore, which takes place on one of these fields is sure to be accompanied with corresponding upheavals in the other sphere. Such a condition could result only in long and bloody internal contentions among a people too prone to the phrensy

of religious superstition. Nor are there present in the Chinaman of to-day any elements which could produce that strong form of government which must ever mount guard, when a people are passing through that transition stage which ever precedes intellectual and political advancement.

The second and more probable line of readjustment lies along the path of foreign influence. This may come in either of two ways, military conquest or a political protectorate. Perhaps no greater calamity could overtake such a nation as the Chinese than the former of these. To a nation so peaceable, and so dependent for inspiration on their social and politico-religious environment, military conquest could result only in a reduction of the people to the lowest depths of slavery and barbarism. All things, therefore, point to a political protectorate as the line of least resistance for national readjustment. But even a protectorate to be effective must fulfil certain conditions. It must be exercised by a nation strong and patient; strong to hold in due check all these impulses which are at all times liable to burst forth when a nation is passing through a reorganizing crisis; and patient to allow a less gifted people time to advance themselves to a higher intellectual and moral level. Such a protectorate could be successfully exercised only by a nation which is able to separate political government from religion; for only in this way could the stability of the governing body be proof against the violent upheavals of a reconstruction period.

Among the ruling powers of the earth, one people alone possesses the moral force and judicious administrative aptitude to stand guard over the destinies of a nation during such a period. To the British people has fallen the destiny of conserving and bearing on the torch of civilization, which though flickering at times is yet destined to illuminate the earth. Already by her conduct in India, in Egypt and elsewhere, she has proven herself true to her destiny, nor will she here be found wanting when the hour for action shall have arrived. But, it may be asked, will Europe allow this work to go on? But here let us not forget that a second Britain has arisen beyond the sea, and however much America may delude herself, at present with a supposed non-interference policy in international affairs, and a distrust of the British policy, to me, at least, it seems impossible that, when the days of her national maturity have fully

arrived, she can any longer deny the inherited instincts of her nature. That spirit which has made Britain a ruler among the nations is the spirit which gave to America her national being. Nor will that common spirit deny its brotherhood in the hour of decisive action.

In our considerations thus far we have looked upon the Asiatic only as a receiver from western civilization, but it should not be overlooked that western thought, high as it is, may receive something from its humble eastern brother. Modern Aryan thought is now so tinged with scientific doubt, and a belief in the unconditioned liberty of the individual as to threaten the destruction of law and government. It would not, therefore, be altogether unprofitable for the western philosopher to turn once more to the East, and there, under the mystic Heavens, to feel that neither spiritually nor physically can man deny the universal brotherhood, nor his dependence on an all-enveloping environment.

In conclusion let me add that these humble predictions have been evolved from the laboured speculations of the student and not from the revelations of a prophet. But whether any or none of these things come true, of this, I feel, we can be assured, that the relations at present existing between the orient and the occident are not long to continue in their present status. Whether their readjustment is to be marked by a giving and receiving of mutual benefits, or with bloodshed and the social decline of either part is evident to the great Ruler of the universe alone.

OPPOSING FORCES VS. INACTION.

Read before the Hamilton Association, February 6th, 1896,

BY H. B. SMALL, OTTAWA.

To relieve the tension of the perpetual struggle which modern requirements have forced upon mankind, we require something upon which we may fall back—something that will tend to calm the excitement of the whirl of everyday life.

Idleness or inaction will not soothe the mind, or quiet the nerves, but a change of action or of thought will, and there is nothing perhaps that will better meet the case than the pleasure to be derived from books and reading. We hardly appreciate our good fortune in belonging to the 19th century, for, one hundred years ago many of the most delightful books of to-day were unwritten, and we possess infinite opportunities of obtaining what our less fortunate ancestors would have revelled in. Sir John Lubbock, not long ago remarked that he was sometimes disposed to think that the great readers of the next generation will be not our lawyers and doctors, our business men and our manufacturers, but the laborer and mechanic. The former work mainly with their head; the brain becomes exhausted, and much of their leisure time must be devoted to air and exercise. The laborer and mechanic, on the contrary, have in their working hours taken sufficient bodily exercise and can therefore give any leisure to reading and study. To further this the schools of to-day afford an excellent education, and access to the best books is now easy to those who desire. The school education now equals the college education of fifty years ago. Jeremy Collier, an old writer, well said of books: "They are a guide in youth and an entertain-
"ment for age. They help us to forget the crossness of men and
"things, compose our cares and passions and lay our disappointments
"asleep. Some relate the events of past ages, while others reveal
"the secrets of nature. Some teach how to live, others how to die.

"They open the various avenues of all the Arts and Sciences; they "are never troublesome, but answer every question. In return for "all their services, they only ask a convenient chamber in some "corner, where they may repose in peace, and are more pleased "with the tranquility of retirement than with the tumults of so-"ciety."

Many readers miss much of the pleasure of reading, by forcing themselves to dwell too long on one subject continuously. If two, or three, different subjects are kept on hand (one of them of an amusing character) by changing as soon as a sense of weariness supervenes, each can be again taken up with renewed zest; but the wider the field the more important it is that the reader should benefit by the very best works in each class. Not that he should confine himself to them, but he should commence with them, and they will naturally lead on to others. Lord Brougham used to say—"It is "well to read everything of something, and something of every-"thing."

In this way only can we ascertain the bent of our own tastes, and a young man's desultory reading will perhaps be one of the most useful means for finding what his life's career should be. By his own discursive reading he can learn what work for his peculiar abilities is open for him in the world, and he will judge easily what line of study he should first pursue. Then, following out this clue, he can proceed to fulfil the requirements of education and the inclination of his own mental disposition. The main practical question of the selection and proper use of books rests not on what is good in general, or in special literature, but what is best fitted for each individual. The foundation of success in life is physical and mental, nervous and moral aptitude, and from this condition future capabilities may be to some extent foreseen. These capabilities are the indicators of the course of reading required, and by them a youth's career should be selected and decided on. It is not in the means or the reach of all of us to travel, but the next best thing to it, when it cannot be indulged in, is the reading descriptions of voyages and travels, and some of them are so graphic, and so ably depict scenes and places, that if the reader in after days chances to visit them, his ideas are prepared for what he sees, and he readily recognizes, almost like an old frequented spot, some at

least of the scenes which the description has already pencilled in his mind.

The fewer well selected books a youth has to begin with the safer he is against loss of time. The most important question at that period of life is not what *shall* I read, but what *need* I read. His care should be to read as *little* and think as *much* as possible; thus he will find what he immediately requires to know, and so make the need the object of his next acquirement in his books. This method tends to education, develops mental power, and makes a cultivated man. A man does not want to be a mere animated book-case, but he wants to have within himself the condensed matter of the book-case. A hurried careless method of reading is one of the chief dangers a student should guard against, and the habit of casting a book aside as soon as read, without pondering over its contents, recalling the argument and refreshing the memory where it failed, is apt to render worthless all the previous effort. Whateley said that writing an analysis or table of contents, or notes, is very important for the study of any one subject. A fact or subject sought out fixes itself more firmly in the memory than most of those passed in the ordinary course of reading. The ever increasing mass of periodical literature tends more and more to the habit of a snatchy mode of perusal, but to a certain extent this has its advantage. A busy man who has not time to turn aside from his own work to the thorough investigation of the topic of the hour may sometimes, in the pages of a magazine, find the case tersely stated by distinguished advocates on both sides, and he may thus discern the main positions of assailant and assailed. A good review of a new work is occasionally afforded by periodical literature. But, to have any real value a review should be read only after the work to which it relates. Distinct from the discriminating reader and progressive student, there is a very large class who are mere devotees of books of any kind, reading, however, chiefly the lighter literature of the day. These become feeble minded, intellectually dissipated and incapable of serious study. This class exists chiefly amongst women, girls and boys, and they become so absorbed in light reading that many of them are ignorant even of the existence of works of standard merit. Men are not so much given to this, but that may be accounted for by their more continuous use of the news-paper, which is to their taste what cheap literature is to the others.

I do not, however, by any means wish to condemn the entire use of this style of reading, for, if I remember right, Gladstone calms his nerves and quiets his brain by reading for half an hour nightly, before retiring, a portion of some new publication which a student or a reviewer would be apt to class as trash. It is the change which refreshes the mind. Literature exists to please, to lighten the burden of men's lives, to make them for a short time forget their sorrows and their sins, their disappointed hopes, their grim futures, and those men of letters are the best loved who have best performed literature's truest office. The truth or falsehood of a novel is immaterial, but to soothe sorrow, to bring tears to the eyes or smiles to the cheeks of humanity is no mean ministry.

> "Oh for a book and a shady nook, where I may read all at my ease of the new and the old,
> For a jolly good book, whereon to look, is better to me than gold."

Before leaving this subject—reading—I wish to impress upon every reader, and especially the young and those with a prospect of many years before them, the great utility of keeping a scrap book for clippings and extracts. Items that appear from day to day may prove exceedingly valuable in the future, and the only time to secure these is whilst they are before you. Anyone who has tried to locate a paragraph or an article he thinks he saw at some indefinite time can testify to the difficulty there is in finding it again. There is not a fact or a fugitive paragraph that you see in your paper, which will not come up again at some future time. But, in keeping a scrap-book never fail to index it, and to keep up the index, or its usefulness is gone. Of course every one can be his own judge as to the subjects, but a literary man will be astonished at the end of a year at what a mass of information he has stored up for future use. State in it also the source from which the scrap is obtained, as well as the date of publication. Speaking from personal experience, when I was a boy at school, I obtained at a London book stall, an odd volume of Robert Southey's "Commonplace Book," as the reprint of his scrap book was called, and its utility was so apparent to me after persual, that I followed out his plans, and the benefits I have gained from my scrap books at various times are incalculable. I have recently

read an account of a similar plan on a more extended scale, now adopted in the Brooklyn Library, and which is assuming such proportions that the space assigned to it is called the "Reference Department," and all its subjects are classified.

Drawing is another opponent to inaction, a recreation too lightly regarded, but which is really a most important adjunct, not only to the pleasures of the leisure hour, but which may be turned to advantage in after life. From an industrial point of view there is hardly any trade or occupation in which drawing is not of daily and hourly utility. For technical purposes it is constantly in requisition, by architects, engineers, military and naval men, designers, and others, and its usefulness to geographers, astronomers, artists, and scientific men generally, is justly acknowledged. Hitherto drawing has been the property of the few, and its acquirement in schools has been classed with comportment and calisthenics. Through its power of representing the phenomena of Nature as they appear to the eye, it appeals in the most direct way to every human being. It enables the artist to stir the emotions of all those who can appreciate beauty in form, whatever may be their nationality. Those who aspire to take a leading and active part in the doings of this and the next generation must look to the requirements of the future, since the world's drama is being played on conditions which rapidly change. They will need the fullest developments of the resources of the body, of the senses, of the mind. Without a knowledge of drawing this complete efficiency cannot be attained. Drawing is an admirable training for both eye and hand, and although artists, like poets, are born, not made, yet everyone can learn to draw elevations, plans, and sections. It is astonishing how many go through the world without the aid of that marvellous descriptive power which drawing affords. The capacities of youth are a mine of wealth, and it is galling to think in after years that we neglected to work a vein of precious metal until all chance of working it successfully has passed away, and nothing is more depressing than to point to one's wasted hours, and the lost opportunities of by-gone life.

Making collections of various objects is a most interesting recreation—whether the specimens be shells, or stones, or plants, or perhaps, stamps, or coins, it matters not, each whilst tending to amuse at the same time instructs. The collection of stamps has often been

ridiculed, but there is much knowledge obtained in such a pursuit. The geographical distribution of countries with a certain amount of their history very quickly impresses itself on the mind of the collector, much in the same way as the numismatist gathers from his ancient coins and medals, a memory of great actions, chronology and heathen mythology, whilst from those of more modern times he becomes cognisant of many points of history, which without these reminders he might never have given heed to. To collect objects of interest in our daily walks, no matter whether leaves or stones, or fungi, or anything whatever, will start a train of thought and lead off the mind with a pleasant strain of reasoning that very quickly dispels the tension in which weightier matters had kept the brain. Kingsley based one of his finest popular lectures on a stone that he picked up by the wayside on his way to the lecture hall, it affording him all the subject matter he needed for the evening. It is astonishing how quickly the idea of arrangement follows collection, and what pleasure is gained in showing to others specimens collected by oneself. Then comes in the idea of rivalry with other collectors, aud of supremacy where the struggle alluded to already evinces itself. But it is a pleasant and an honorable struggle and one to be urged on all who wish to make life pleasant, and to step off once in a way from the beaten path of hard brain toil and the dry details of a business life.

Botany, probably because of the names or terms used in it, is regarded by many as a dry and difficult study. But without a knowledge of it, however much you may admire flowers or trees, they are like a beautiful woman in a crowd—a stranger to you. With a knowledge of it they become at once friends—you know something of them. You go out into the fields, or the forests, or along the riverside, and the familiar families of plant life all have an interest in your eyes.

Again, take Natural History. Its study equals in the pleasure it affords the sportsman's pleasure in the chase, and whilst his sport is confined to the comparatively few species of game left in its natural state, the naturalist has open to him the insect world, birds and infusoria—a countless number, the pursuit and study of which are equally as fascinating as the hunters' trophies of his gun.

Take Geology, where the untrained eye sees nothing but dirt and mud, science will reveal wonderful possibilities. The mud is a

mixture of sand and clay, and dirt; separate it and see what a history its component parts have; strain out the water, and its study alone is a history. Ruskin well describes this when in speaking of a street gutter he says, "At your own will you may see in it either "the refuse of the street or the image of the sky."

Take electricity. No branch of science rivals in interest that of electric force, and at no time in the history of research has any branch of science made so great or so rapid progress during the years since 1881. With its now acknowledged usefulness for lighting comes its introduction for the production of power, and many trades requiring the application of a motor for driving light machinery will have an ever ready source of it at their command in their own quarters. Its power for lighting mines and at the same time affording motive power in them is now being utilized in the mining districts of the west. Late English papers describe its application for lighting purposes at the new St. Catharines lighthouse at the southern extremity of the Isle of Wight, to the extent of 700,000 candle illuminating power, replacing the former oil light at the same point of 730 candle power, thus being 1000 times more brilliant. The *Spectator* calls it the "legitimate descendant of the beacon on the hill-top, developed "through the different stages of the tallow candle and the flat and "concentric wick oil lamp." The same page says, "We wonder "to-day at such achievement, but perhaps our descendants will "illuminate the more frequented sea routes as we light our streets, "with buoys bearing powerful electric lights upon them, the light "gendered by the action of the tides, and will marvel that we could "have been content to let our great ships blunder on the rocks or "fall foul of one another for lack of so simple a precaution." For driving street cars electricity is demonstrated already. For a motive power in steamships, experiments are now going on to develope it, and the result when attained will be of incalculable advantage, as the space hitherto occupied by coal will become available for cargo. Electricity again is applied to surgery and is used in the fine arts; there is no saying what it may not yet be made to do, and the old remark holds good, that "Magnetism is in its infancy, and electricity "is as yet unborn."

Take again Astronomy. Within the last quarter of a century a remarkable advance has marked the methods and aims of astronomy.

A younger and more vigorous science has sprung up, walking with hurried or halting footsteps along paths far removed from the staid courses of its predecessor. The new science concerns itself with the nature of the heavenly bodies, the old one regarded exclusively their movements. This younger science enquires what sun, moon, stars and nebulæ are made of, what stores of heat they possess, what changes are in progress, what vicissitudes they have undergone, or are likely to undergo. The elder study attained its object when the theory of celestial motions showed no discrepancy with fact, when the courses of the heavens came directly up to time, and their observed places agreed to a finitesimal point with their predicted places. Very different modes of observation must now be employed to further such different objects; in fact the invention of novel modes of investigation has had a prime share in bringing about the change in question, and investigations carried out at higher altitudes than have hitherto been more than temporarily available are now going on in permanent observatories. The great Lick Observatory, of California, founded through the princely generosity of one man, whose name will live in the annals of liberality forever, James Lick, will soon add to the marvels of knowledge most astounding facts, if we are to give credence to what the observers have already unofficially announced. Located on one of the peaks of the coast range, 4440 feet above the sea, the atmosphere in summer is cloudless; and even during the winter there are many nights favorable for observation. Out of sixty nights tested, prior to the site being fixed upon as to the quality of telescopic vision there, Professor Newcomb found fourty-two as nearly perfect as possible, seven of a medium quality, and only eleven cloudy or misty, and his season of observation extended over the first half of October. With the ordinary telescope he then used he discovered forty-two new double stars, many of them not having been seen before clearly enough for the discernment of their composite character. But the present needs of science are by no means filled by an altitude of of 4000 and odd feet. Already observing stations are recommended at four times that altitude, and the ambition of the coming astronomer will be satisfied only when he reaches that altitude where he can no longer find wherewith to inflate his lungs. Such are the growing exigences of celestial observation. Europe has not remained behind America in this significant movement. An observatory was

nominally completed on Mount Etna in 1882, from which Professor Langely dlstinguished nine stars forming the pleiades, whilst from ordinary levels only six can be seen with the naked eye, and glimpses of a seventh and an eighth with telescopic aid. Nature seldom volunteers information ; usually it has to be extracted from her by skilful cross-examination. No opportunities of seeing will avail those who know not how to look, and the elevated sites now chosen for the exquisite instruments constructed by modern opticians, give abundant promise of increased astronomical knowledge.

I could cite the various branches of study, all tending to oppose inaction, but I must pass on to a close. Science has done much to ennoble mankind in freeing it from superstition. Before its searching light the belief in witchcraft and ghosts has disappeared, and intolerance of every kind is fast on the wane. The most important secrets of nature are often hidden away in the most unexpected places. The refuse of factories has, by the application of science, yielded many articles now in daily requisition, and things which are familiar parts of our everyday life would still be unknown except for scientific research. That discoveries innumerable await the successful explorer of nature no one can doubt. Sir John Herschell said : "Since it cannot be but that innumerable and most "important uses remain to be discovered among the materials and "objects already known to us, as well as amongst those which the "progress of science must hereafter disclose, we may conceive a "well grounded expectation not only of constant increase in the "physical resources of mankind, and the consequent improvement "in their condition, but of continual accession to our power of "penetrating into the arcana of nature, and becoming acquainted "with her highest laws. And it is not only in a material point of "view that science would thus benefit a nation, but it will raise and "strengthen the national as surely as the individual character. The "field on which the victories of science have already been won, is "teaming with problems of the widest bearing on many questions of "the day—social, philosophical, religious and natural. To the "scientific man belongs the spirit of the great world, brooding upon "things to come. In the truest sense his is the future. The in-"heritance of the part is ours, and in the literature of our own and "other countries we may study the great generalizations of science,

"clarified by their passage through great minds, twined to shape, "and incorporated in the consciousness of the race by the pen of "poet and philosopher. Firmly centered in the present we can "reach out a hand both to the past and to the future, and become "the heirs of all the ages. But we must bear in mind that science "is not to be degraded to a machine for grinding general laws out "of large collections of facts. We must guard especially against the "error of assuming scientific arrogance whilst in search of evolving "a true scientific spirit, and of becoming overbearing whilst discuss-"ing with those who differ from our views."

Science is no longer looked upon as dangerous to those who follow it; faith is never weakened by its attainment. The materials of the universe by which we are surrounded are full of the evidences of a Creator; they crowd upon us from every side, wherever we turn our eyes we read them. Their evidences are inscribed on the blue dome of Heaven and on the gorgeous cloud turrets of the western sky, on the rocky cliffs which record the memories of long buried ages and on the green sods which cover the last new made grave. The material with which the Eternal writes His name, and the style of His handiwork, are evermore the same, whether He writes it in the golden characters of the mine or the metallic lustre of the hills, science recognizes its great Author's hand and admires with reverence His matchless autograph.

Science and art are constantly coupled together, but they really move in very different planes and touch different parts of human nature. When science comes in at the door, art flies out at the window, for the former appeals to the intellect, art to the emotions, and man is so constituted that when intellect is in the ascendant the emotions sink out of sight The sympathizing spirit of art is opposed to the critical spirit of science. The artist seeks beauty, finds likenesses and discerns the ideal through the real. The votary of science seeks facts, draws distinctions, strips the real to the skin and bone. Poetry is the art of arts, but what would science do with the finest poem? The revels and play of poetic fancy would wither and shrivel under the hard realism of science. And this is why science needs to be cautiously handled and taught. It must not be roughly thrust on the student, but gradually instilled. Its teaching must be popularized, placed before the people in an easy and familiar way, devoid

of long words and classifying terms, and so explained that all may understand. The lectures before such a society as ours should be of this nature, explanatory and pleasing, yet possessing instruction, for pedantic illustrations never carry an audience with them.

Then, there is a difference again between literature and science. The former holds a certain attitude of conservatism, the latter is essentially revolutionary. In a few years hence the theories and writings of scientists of the present day, on many points, will be laid on the shelf, and like coral insects, those who built the science of to-day, will be dead from the moment that their successors have raised over them another inch of the interminable reef. They will have lived their day and done their work in paving the way and laying foundations for fresh lines of thought, for new theories of speculations, and whilst we at times feel a disposition to smile at what we are pleased to term "exploded" ideas and chimerical deductions, we must realize that what we ourselves accept as established facts will in all probability, under the kaleidoscopic revolutions of science, raise in future generations another smile at our want of penetration. The nebula we describe may turn out a star cluster, the aurora may be traced to far other causes than those we now assign to it, whilst the adaptability to navigation and other practical arts of the wild effusions of a Jules Verne may prove not in themselves a wonder, but a wonder why their adaptability lay so long unnoticed nor made use of.

NEGLECTED METHODS OF EDUCATION.

Read before the Hamilton Association, March 5th, 1895.

BY T. W. REYNOLDS, M. D.

In selecting a subject for discussion I am in a measure treading in the footsteps of others, but in view of the fact that our Association's great aim is educational, I feel that no further apology is necessary for the choice that I have made. Certainly no one, in what we so proudly and justly call "this enlightened age of ours," will dispute the value of education, but I think our time can be profitably spent in considering some of the methods of achieving that great desideratum, a good education. Some of our members who are members of the great teaching profession will perhaps feel inclined to say that I am introducing matters which are not only the province of the various teachers associations, which meet from time to time throughout the province, but have been far better dealt with at these meetings. Such I have no doubt is the case as regards the ordinary recognized methods of education, but even as an onlooker is always said to see more of a game and to be a better judge than those actually engaged in it, so in this case I think that a layman like myself may be permitted to at any rate relate his experience in the hope that possibly something of value may be found therein, at least to those of us who are amateurs at the best as far as teaching is concerned; although from my own professional experience I know that the truly eclectic man is ever ready to avail himself of suggestions or experience wherever found, be it among professional men or lay. I feel also that in drawing upon my own experience for ideas, there is a strong possibility of offering something original for your consideration and thus laying before you the equivalent of special investigations made in any of our special departments of work. My title though reminds me that it is, however, not the ordinary methods such as are generally

accepted and approved of and have received the sanction of professional educationists that we are to consider, but it is those that are generally neglected.

I have desired to call your attention to these because of my firm belief that there are many valuable aids to education which have either been relegated to the shelves of a cobwebby desuetude or else are still regarded as mere so-called fads, which are only thought fit to be considered as mere pastimes or recreations for individuals contemptuously called cranks by those who alone in the eyes of the world are ordinarily deemed to be truly wise. As on another occasion I had the honour of offering myself as a champion in the cause of fads, I do not intend this evening to more than casually refer to their value from an educational point of view, but I shall endeavor to discuss the other methods that seem to me to be now neglected. At the same time I must admit that I have no doubt that in many branches taken up in the schools the differences between the methods that are now in vogue and those used in my school days are to the credit of modern methods, but as I said I wish to call attention to some that I have good reason for believing are now discredited in great measure.

Before entering upon the consideration of these methods, it would be as well, perhaps, to define what is meant by the comprehensive term, education. Literally it means to lead or draw out, but although the office of the educator can to a certain extent be thus described, still there are other processes at work or that should be such as those of building and strengthening these tender faculties of the intellect which are thus brought to light.

Various similies have been used, and one with which we are particularly familiar was, I can well remember, to be found in one of the school books in use twenty-five years ago. This allegory I think was from Addison's Spectator, which expresses the idea of education thus: "What sculpture is to the block of marble, education is to the human soul." I have not my old school books at hand and am indebted to a more modern work for my quotation, but I can well remember how the simile took my fancy of the statue being concealed in the block of marble until the sculptor by repeated efforts produced the statue and gave it its fine finish and brought to light its various beauties of form and outline.

But though I am a great admirer of the work of the stone mason and feel that many beautiful lessons can be derived from such similes as that above mentioned, there is another simile which I think is more appropriate, and especially on account of its bearing on the subject I have chosen it now.

The simile which I would present is that of the work of a gardener in tending and rearing plants either for the house or garden. This may seem to be a resort to a very ordinary occupation, and yet therein lie some very valuable lessons to which I would like to draw attention.

Let us look then at Horticulture, or perhaps I had better say Floriculture, for it is the care of the tender flowers that calls forth the efforts which seem to me most symbolical of those of the educator, for we find the skilful gardener will not only sow the seeds from which in time the beautiful plant will grow, but he will also see that the proper soil is provided, that this soil is well watered and manured, and that the proper amount of light and heat are also furnished in order to favor healthy growth. Floriculture is also a valuable example to us, in considering methods of education, because it is so universal an occupation amongst all classes of society, not only as a livelihood, but as a favorite recreation, and one justly popular, while from the three classes of floriculturists that are to be met with we can I think draw types of three classes of educators.

The first class of floriculturists are what I would term the domestic class, those who take the complete charge of their gardens, not by any means as I intimated as a livelihood, but as a most delightful and at the same time profitable recreation. For where can more healthful pleasure be found than in the work attendant upon a garden of one's own, where one does all the work oneself, preparing the ground for the seeds or cuttings, then doing the necessary planting, followed by the interest with which each stage of growth is watched from the time that the first tiny leaf is seen above the ground till the last available flower has been picked, while at the same time the ground is kept carefully weeded and watered, and should occasion require, the plant is shaded from too much sunlight when it is liable to be injurious; and where can we find such flowers as are to be found in these gardens that have been tilled by these domestic floriculturists, flowers that are often slightingly designed old-fashioned,

but which far excel in fragrance and beauty those that are to be found in the gardens of the other two classes to which I will refer.

The second class of floriculturists are those who get outside professional help to do the heavy work, often from want of time to do it themselves, to give them due credit for their efforts, and then look after the easier and more enjoyable parts of the work themselves. Such gardens often have rarer and more showy plants than are to be found in the first class of gardens.

The third class of floriculturists are the purely professional, and while the gardens taken care of by them are often more admired by the ordinary passerby because of the gorgeous and costly plants they contain, the owners of these gardens will not have the satisfaction that they would have experienced if they had taken either complete charge or even the partial amount which fell to the lot of those in my second class.

Let us now return to our text, so to speak, and see where the simile is applicable. To begin with, I think we can divide methods of education into three great classes, viz.: 1st, home teaching; 2nd, part home and part school education; and 3rd, complete school or professional methods.

The first class that I would refer to are the professional class, and of their methods I have but this to say, that having been educated myself in a great measure in the common schools of our beloved Province I have the deepest respect and gratitnde for their methods, but at the same time I would say this that I think they will be most successful when they achieve the utilitarian and not the ornamental only, when to return to our simile, they show in their gardens the good old domestic plants brought to a higher stage of perfection by the more successful methods at the disposal of the professional gardener.

The second or middle class therefore is the one that should be most successful, as it should combine the amateur or domestic class and the professional, but unfortunately it often tends to take only a smattering from both, but not their strong points, which would make such a powerful union.

The last or domestic class is the one to which I would draw particular attention because in a great measure it comprises those

methods that seem to me to be neglected, in fact they are mainly to be found in this class.

The domestic class therefore being so important in my estimation, it will be advisable for me perhaps to explain what I mean, and it is this: The class which provides that finish and, at the same time, that good foundation for a first-class education, which are to be only had where the parents are able and willing to not only impart the first rudiments, but when it is deemed advisable to send the children to school, maintain a careful supervision of the lessons taught in school, while at the same time they are constantly imparting information in branches which only can be properly taught at the home fireside. Here I would revert to my garden simile, for as in an old fashioned flower garden there are many sweet flowers such as were to be found in the gardens of our grandparents, such as it is apparently impossible for professional gardeners to rear, so there were many lessons that our parents learnt from their parents and we ourselves may have learned in a measure, but which we do not seem able to have either the time or ability to impart to our children, and it is useless to look to our schools for instruction in them.

However, I am reminded here of an apparent injustice I am doing our good friends, the members of the Y. W. C. A., and moreover, this reminder is made the more forcible because it has the support of my allegory. Within the last few years, amongst flower-loving people, there has been a demand for some of the oldfashioned flowers, such, for instance as sweet peas and cornflowers, and the florists have accordingly attempted with varying success to supply the demand. In the same way there is now also an appeal made for instruction in domestic arts, and the matter has been brought very forcibly to the attention of the Board of Education by the Y. W. C. A., but I have grave doubts whether the training that these ladies are so anxious and willing to give would equal that received in the old school, the home. Many a joke is made about the comparisons made by young husbands between their wives' cooking and that of their mothers, the contrast being in favour of the latter; and certainly our parents and grandparents had much skill in this respect that could never be achieved in our best equipped modern school of manual training, and the same may be said of housekeeping in general.

It will naturally be asked then to what are we to attribute this state of affairs? Are we not, it will be pertinently asked, as clever as our parents, and are not our facilities greater? To which it must be promptly answered that there is no evidence of mental degeneration, nor are we wanting in facilities, but on the contrary we are truly blessed in this respect and are justly proud of our possessions.

But this pride, alas, is a presage of our coming destruction, and to this abundance of riches we must attribute our poverty, for, unfortunately, where we have so many means of achieving what we desire we do not content ourselves with one or two implements but are ever looking for new ones or else too gladly trying the new ones that are advocated.

Another evil arises from the apparent greater activity of our minds. We are so constantly like the Athenians of old, looking for something new, that we forget the injunction of the ancient sage that there is nothing new under the sun.

As a result of this constant looking out for new objects of interest we find there is either a continual neglect of the old reliable interests or else there is a tendency to superficiality. We get only a smattering of knowledge of the various branches of education to which we apply ourselves, and our time is so taken up with our various occupations that we have no time for any of them and are liable to neglect often some of the most important ones. Like a child surfeited with new toys we will ere long have a cupboard full of cast-off occupations and recreations.

This too constant absorption and ill-advised arrangement of our time is, I take it, one of the features of our times which is of rather grave omen, and should require our most serious consideration, for in time, as a result of the anxiety and worry which are often necessary concomitants, there cannot but follow exhaustion of the intellectual faculties with all that that means, in fact at times insanity and even death.

Another evil too that we sometimes see is that by an apparent repulsion we lose heart at the thought of so many expedients lying before us, and we do not exert ourselves to make a proper selection of the materials at hand, but having one or two fairly servicable we content ourselves with them, and so drop into a stereotyped method

and soon fall behind in the race of life, not from over use but from an equally deplorable disuse.

On all sides it will be admitted that this age is also in danger from the fact that old fields of labor are fast becoming exhausted, not only from the want of that productiveness which might supply the demands that would have been made by our forefathers, but because there is such a keen competition from so many more occupants being in the field, that they are driven to seek new fields which will soon suffer from exhaustion unless something is done to regulate this competition and make a better adjustment of the time at our disposal.

We must seek for relief therefore, and in our methods of education naturally think that we will find that great assistance can be obtained, but unfortunately not so much as we wish and this I think is due to the fact that too much is now expected from our professional schools of education while we neglect the domestic school.

There is also a tendency on the part of the home authorities to shirk some of the responsibility that rests upon them. I have already endeavored to show some of the reasons for this, noteably the great want of time in this busy age.

Another factor is a peculiarity of human nature that we see illustrated in the dealings of the public in general with other public arrangements for their welfare, for while at one time they would look askance at the proposals of educators to help them, now they expect everything from them, even as in the case of hospitals and asylums; at one time the public could hardly be induced to send their relatives and friends to them for treatment, while now a great difficulty that those in charge of these institutions have to face is how to prevent unsuitable cases being sent to them.

There is also a tendency to shirk responsibility shown in another way on the part of the domestic school. We are constantly being treated to dissertations on the amount of home work that is imposed on scholars. Now I am quite willing to admit that there is considerable foundation for the charge, and it forms in fact one feature of that state of affairs I have referred to, viz., the disposition in these days to multiply occupations and so absorb too much of our time. But there are, as in every case, two sides to this question and I think there is a

tendency to misplaced sympathy, too much being given the scholars and not enough shown for their painstaking teacher. I have never taught school myself, as far as day schools are concerned, but I will admit to having had a little experience in Sunday school work, and from what I encountered there I am disposed to sympathize very much with the teacher, and I think that if the different classes of educational methods were put on another footing far better results would be achieved.

I have already expressed my disapproval of the tendency to multiply studies, but I have no objection to a variety if properly managed. In my own experience at the schools I attended, during the acquisition of my elementary education, many subjects were actually crammed into my memory which I have long since forgotten. For instance in the common school we used at one time to memorize long columns of dates without any information as to the events they represented, but these have long been forgotten, never to be recalled, except perhaps when the same figures are presented to notice, as the number of a telephone—my tailor for instance has the same number as the year that one of the English monarchs came to the throne. During my professional course, though, I had an experience that I think might be utilized as a partial solution of the difficult problem of arranging children's lessons. At the medical school we had, as is more or less the case everywhere, a certain number of didactic lectures, and on every subject we had to attend two courses. These lectures we used to take down in our note books more or less fully. When the time came for the second course of lectures we would find that our professors would often repeat the lectures word for word, and accordingly used to adopt the plan of following the lecture with our old notes, making additions when any new matter was introduced. Then, on returning to our boarding houses, instead of reading up our notes as we had to do when first we took them down, we could read up our books of reference or text books on the same subject. Now why could not a similar plan be adopted in our public schools. Let the teachers teach the subjects in the schools and then let there be home work bearing on the work of the schools, with just enough to learn to fit the scholars for long enough examinations next day to show that they have profited by the teaching of the day before.

By no means do away with home work, but on the contrary let the domestic feature be encouraged for several reasons: First of all, the teacher with a large class numbered by the scores cannot individualize and give that particular attention to a scholar which could be given at home of an evening, and so assist in maintaining the degree of progress attained by a brighter companion. Secondly, even as the owner of the garden referred to in my simile, who works it himself, will not only enjoy the recreation of gardening for the sake of the flowers that will grow all the better for the time he devotes to them, but will also feel stronger and brighter in every way, so the parent who looks after his or her child's lessons of an evening will not only feel rewarded by seeing his child's mental growth but he will find that his own mental powers are refreshed by the return to subjects once well known but now long forgotten. Thirdly, the parent can also act the counterpart of the reference books and text books used by the college student, and give information often that will serve to impress more fully the lessons taught in the schools than ordinary school teaching will do, for undoubtedly the lessons taught by a parent have far more lasting impression than those taught by an outsider, who has not the influence that instinctively goes with the instruction imparted by a loving parent who has gained the confidence that the most skilful teacher may take years to win from the scholar.

Another reason that I would advance is that there is too much tendency in these days to desert the home circle of an evening, when there are so many outside attractions and such a tendency to seek amusement from home, on the part of not only the fathers, but even the mothers and children themselves. If, therefore, the parents made more of a practice of looking after their children's lessons of an evening than I am afraid is often the case, while at the same time the teachers arranged their share of the work so that the lessons would not be too extensive, we would find the home circles would have time for profitable recreations as well. Many a parent who now finds his time so all-absorbing would find that as a result of the time so given up of an evening he would be able to turn his attention with far brighter faculties to his business the next day. A series of children's books was much in vogue thirty years ago, some of them if not all by Maria Edgworth, the principal characters being a boy and girl named Harry and Lucy, that in fact being the title of some

of the series. These two children were made to take what we would now consider rather an oldfashioned interest in popular science, but nevertheless for my part I have never forgotten some of the information that I derived from them, but what I would particularly call attention to was the method in which these children were taught. Harry used to discuss these subjects with his father while the latter was shaving in the morning. In our days the average father has no time to shave in the morning; he either shaves at odd times when he thinks he most needs it, or else rushes into a barber shop at a spare moment. Now how much better would it be if we could only arrange our business affairs so as to have these spare moments, not only for our children's instruction, but to save ourselves from a premature exhaustion of our faculties and energies.

So much for general teaching. And now there are some especial branches that are either neglected or improperly taught, so far as my observations go and judging from my own personal experience. But first of all, to be candid and at the same time better enforce my remarks, I would like to refer to the well taught ones. To begin with then the three R's, reading is certainly better taught than it used to be, and in fact the same may be said of the other members of the group, for before I left school more prominence was being given to the practical rules in arithmetic, and easier methods were being adopted, while writing also was being given more attention to, though I notice that the business colleges are still inclined to teach fancy writing. Shorthand writing was barely known in my time, and though bookkeeping was taught it was not taught any too well then. Spelling, of course, we used to learn, but I think the great fact was not sufficiently emphasized, that a good speller must ever try to have the word he would spell before his mind's eye. In these days of phonetic spelling there is, I am afraid, a tendency to lose sight of the derivation of words and encourage the cultivation of the ear more than the eye, but it will be none the less needful to picture the word especially until the new characters that have been advocated are fully adopted.

Literature in my day was an almost unknown subject, and even now I think that while it forms a prominent feature of our school curricula, it is one of the branches that would be the better taught if the home influences were called on to assist. In my day the

specimens of English literature that were brought to our notice were only produced as reading pieces, or else, what was most uninteresting of all, to be analysed, and nothing could be more likely to make the average scholar detest a selection of poetry than this attempt to find the subject and predicate in a specimen of Milton's blank verse. Having then my own experience in this respect in view I would beg my friends the professional educators to see to it that there is nothing in their methods to create a distaste for the author whose works may furnish the literature for the year's examination, but on the contrary encourage them to make a study of the same author when at home.

The next subject I would refer to is one that I approach with fear and trembling, and that is grammar. During my school days I had at least three different text books on the subject as far as English grammar is concerned, and from what I can gather there have been several since, while it is doubtful to my mind if it is really properly taught yet. And here I think that the best instruction is to be had in the home circle, and that it will be found that the best grammar is spoken by those who have the best ear and have been taught from their earliest years to almost think it a crime to use bad grammar. There are two particular bugbears whose use has probably been a puzzle to us all, those little words "shall" and "will." My mother, who was English, used to proudly tell me that an Englishman never made a mistake in their use, while she would intimate to me that as my father was Irish it was very doubtful whether I would ever learn to use them properly. In one of J. M. Barrie's works he makes one of his characters, a London editor, say to the hero, who is being given a position as a leader writer: "You are Scotch, are you not? How are you on the use of 'shall' and 'will'?" To which he is bound to reply that he is not at all certain as to their proper use.

There are two other branches which are liable to be thought dry and uninteresting, viz: geography and history. These, I think could be made more attractive if the domestic school was more appealed to, and also if in teaching the former we did not simply teach the names of rivers, lakes, and seas, islands, peninsulas and capes, cities, towns and villages, and state the boundaries of the countries, but on the contrary endeavored to point out the historical points of interest connected with them.

Then with regard to history, do not let it be an accumulation of dry dates and enumeration of facts to which they correspond, but let fuller particulars be given of the most important ones.

With regard to geography, in these days of excursions it is within the power of the teacher, whether belonging to the professional or domestic class, to visit some of the points mentioned and thus be better able to describe them.

An especially weak point though, in my experience of the teaching of history, is that not enough attention is given to Canadian history. I was taught very little of it at school because I was allowed to skip a class after a promotion examination, and the class I passed over was the only one in which was taught Canadian history. The other day I picked up the school history now in use and found that it was, according to the title page, both an English and Canadian history, but on investigation discovered that the Canadian section was at the end of the work, and I wondered whether in all probability that part of the book would ever be reached.

There is, I know, rather a tendency to belittle Canadian and American history, and also make out that there is very little of literary and historical interest to be met with when travelling in this country, while we dilate on the points of interest and beauty to be met with in other countries.

I will admit that I have erred in this respect to some extent myself, for many of the places of note in this country that I have visited during my holiday trips were the objects of tours I have made since visiting the European continent. At this present time there are people in the city of Hamilton who have never perhaps visited the Thousand Isles. In 1894, I met a young Hamiltonian who had often visited Muskoka and Georgian Bay, and who was then making his first trip down the St. Lawrence, while I had then just returned from my first visit to Mackinaw, and last summer was the occasion of my first visit to Parry Sound and Muskoka. To come nearer home, how many have visited Lake Medad? I, for one, have not, and if it had not been for field day trips of the biological section I might yet have to make my first trip to Ancaster sulphur springs or the burning spring at Mount Albion. I have also heard of people who had never gone up the incline railway to see the view; some have never been in the public library building or the museum of our

Association, while others have never visited Chedoke or Webster's Falls, and I must confess that I have never yet gone to the top of our City Hall, although in 1890 I went to the top of the Capitol at Washington. These instances alone will show how much of practical geography might be learnt at little or no expense if we would only look about us while at home.

Then to turn to history, how many have visited the scene of the battle of Stony Creek? How many are acquainted with the history of even our own city and can tell where the first Protestant church in Hamilton stood? I had the actual building pointed out to me on the occasion of a visit to Hamilton in 1878, the first visit that I ever made here, and like many visitors I saw things then that I might never see here when a resident. How many have read the history of the first trip made to Hamilton or Burlington bay, of which we have record? Then to turn to the physical geography or history of this neighborhood, how many have read a paper read before our Association which advances the very plausible theory that the Grand river once emptied into Hamilton bay? Considerable interest might be roused also amongst scholars if they were taught the origin of some of the names of our cities or even our very streets. A visit to some of our churchyards and cemeteries might also be made very interesting from the historical suggestions that would arise from some of the inscriptions. I remember one of my friends telling me how impressed he was with the fact that no members were to be found in Hamilton of some families whose names he had seen in Hamilton cemetery, and the same could be said of most old cemeteries.

By thus exciting an interest in the history of our own locality, we will cultivate a taste for investigations of a similar kind when visiting other parts of our own country, and I think it will be found as I have already intimated that we need not bewail the want of historical associations in connection with the different points to be seen when travelling on our own beautiful rivers and lakes.

Quite as stirring scenes have been enacted here if we only had the records, and it is a most favorable sign the interest shown in the proceedings of the several historical clubs that have been formed throughout the Dominion, and the increased patriotic sentiment that is being fostered.

But while I would thus advocate the special study of our own history, we must not forget the history of the land from which our forefathers came, as so much of our own history is involved in it. However if the interest is properly aroused in our own, as a consequence it will soon follow that the scholar will want to extend his studies in the direction of the history of the older countries, and moreover, I think he will find the study less irksome when taken up under those circumstances.

Another branch of study that should be more encouraged is that which we as members of this Association are particularly interested in—the study of the geology, fauna and flora of our own land, and this also is work for the domestic school in particular. On other occasions I have presented my views on the subject, views which I am sure will be echoed, and in fact have been already often dealt with by other members of the Association, but in view of the pertinency of the subject a further reference will be in order now.

The particular point that I would dwell on is that not only is the study of natural history in all its branches of value from the interest attached to the objects of this study, but the fact that they are best studied in the open air, necessitating long walks or drives, is alone of great benefit, especially when it draws those whose occupations are inclined to keep them too closely confined, away from their toil and worry, consequently when these branches are being studied in the domestic school as they should be, the parents who take a proper interest in their children's lessons will reap this benefit, thus carrying out my garden simile in an additional way. Another very important argument in favor of the study of natural science is that it cultivates the child's powers of observation, and thus gives them another great aid to happiness.

I think no better instances of the value of the life devoted to this study could be found than is presented by some of our worthy members. One I know of was failing in health and was ordered to give up business and keep in the open air. This gentleman, who is now residing in another city, when he was ordered to stay out of doors as much as possible, accordingly devoted himself to entomology, and so thoroughly that he was able by his contributions to scientific journals to enhance the happiness of his friends while he now holds an important position in connection with his chosen study.

I would also call attention to the life of the gentleman whose notes have often been contributed to our meetings. A conversation with him is a marvellous treat, and especially if in the open air. There is not a plant that he does not know the botanical name of, and not a bird whose note he does not recognize at once.

In conclusion, I would say that to some of my hearers I may seem to be rather too conservative and inclined to discredit modern advances. Such a charge I would refute, for no one is more willing to admit the value of new systems and methods, but I would like to utter a note of warning as the spirit of competition is so great and there is such a tendency to consider the latest invention and theory the best, that it behooves us to be on our guard, and while we would prove all things and by no means reject them because they are new, yet let us give them a careful test and then only hold fast that which is good. These ideas I am afraid are rather fragmentary and at the best only suggestions, but if they in any way assist in our work as educators I will feel highly rewarded.

LOCAL MUSEUMS.

Read before the Hamilton Association, Nov. 7th, 1895.

BY A. ALEXANDER.

The subject which I have chosen for this night's paper is "The Local Museum as an adjunct to our educational system." A *dry* subject you may say, but not so to me, though very likely you may consider my *treatment* of the subject as dry as the average museum specimen is.

Allow me to preface my remarks on the subject proper with a few reasons for choosing this subject for discussion.

And first of all, I may say that though we have had a museum as you see it to-night for about fifteen years, we have never, as far as I know, once sat down together to decide what our objects were in founding and continuing it. This may appear rather a serious reflection upon our wisdom in this connection. Well, I thought it must surely be time that we as an Association should look our museum and each other straight in the face, and ask each other and ourselves what we propose doing in relation to it, and what we had been doing for the promotion of Literature, Science and Art through the influence of this miscellaneous collection which we call our museum.

In the second place, I may state that ever since 1888, the year when we began, through the Biological Section, the collecting, naming, classifying and preserving, for future reference by the botanical students and general public of the city, of the native flora of the Hamilton district, from a defined area, I have had the idea ever present to my mind which I purpose trying to make clear in this paper, I thought if plants, why not animals and rocks, fresh water and land shells, and insects?

It always appeared to me that not only to the teachers and students of our college and common schools, but also to the ordin-

ary dweller in our city, such a complete collection of the natural objects found in our neighborhood, properly classified, named and clearly labelled and openly exhibited, would not only be interesting beyond conception, but would be a great aid and auxillary to the educational machinery of our city. Not only would such a collection, if formed on the lines which I will indicate, be a valuable adjunct to our school system, but also to our Free Library, for surely the actual specimen of bird, or insect, or flower, must convey a clearer and more perfect conception than the best executed illustration in a book possibly could do.

The third reason that I will name for bringing this matter before my fellow members to-night is, that among the many sights which interested me in 1892, during my visit to Europe, none pleased me more than a visit made to the new Great National Museum of Natural History at Kensington, London, and to a museum in my native county of Perth, Scotland. In the former I saw what appeared to me a *perfect* collection arranged on the lines on which the museum of the future will always be if it is to take its place as an educational factor.

It is not necessary here to give a description of the vast building, or of the seemingly interminable succession of airy, light and spacious galleries and rooms, and the collections from every part of the world of the former named institution. Suffice it to say, that in it is contained all the natural history objects removed from the British Museum, as well as the collections of nearly all the learned societies in London, including those of the Royal Society, the Zoological and Anthropological Societies, and others.

It is in truth a NATIONAL Museum, and worthy of the Great Empire, at the heart and centre of which it stands.

The other museum is a provincial one, and is in the town of Perth, on the beautiful banks of the Tay. This museum has been in existence as an old-time museum, or curiosity shop if you like, for many years, for I remember being taken to it by my father more than half a century ago; but, except a dim memory of an elephant's tusk, an alligator, whose glass eyes were dim with dust, a mummy case said to contain a second cousin to one of the Pharaohs, with numberless rusty swords and claymores, chairs that Scottish kings and nobles had sat on, with many stuffed birds and other natural

history objects, all without arrangement, or, as far as I remember, any attempt to convey any definite idea. But now how changed! It seems that about twenty years ago a few enthusiastic naturalists connected with the society having charge of the museum, resolved to make as complete a collection as possible of the flora and fauna of the county of Perth, and only last November the collection which I saw in 1892, with additions since made, was removed to a fine new wing built on purpose to receive this local gathering of the birds, animals, flowers, rocks and minerals of the county. Among these collectors was Colonel Drummond Hay, of Pitfour Castle, a resident of the parish in which I first saw the light, and who has made a life-study of the habits of "The Birds of Tay," and who has contributed nearly the whole of the magnificent ornithological portion of this fine collection. The occasion of this opening was considered so important from a scientific and educational point of view that all the leading educationists and scientific men of neighboring counties were there, and several from Edinburgh and London, as well as the leading citizens and country gentry. When I saw that collection three years ago it seemed to me a realization of the dream I had been indulging in regarding this museum of ours. What they have done we surely can do. If they had a Colonel Hay we have a Colonel Grant, who has shed a lustre over geological science and collecting, and therefore on us just as the former has on ornithology and the Perth museum. And have we not a McIlwraith, who has with a life-long devotion given himself to this study, and whose bird knowledge has been laid at our feet, and who has by the same made us known and respected in many lands besides our own. Need I speak of Mr. A. E. Walker and our worthy President, able coadjutors of Col. Grant in bringing to light the hidden things of the rocks. These, with Mr. Dickson in botany, and the yet undiscovered successor of our good friend Mr. Moffat in entomology, should give us good heart in starting out to found and carry out what I am sure must be the museum of the future in this city.

If we make an effort therefore to so agitate this matter from to-night that we can get the authorities, either national, provincial or municipal, to believe that the district museum on the lines indicated by this paper is a necessary part of the country's educational equipment, we will have done a good work, and helped on the gen-

eral advancement of human knowledge of the common objects which are lying all around our path.

The only other reason why I chose this subject, which I will name, is that some months ago a sister society in this city was agitating the question of a museum, I presume primarily historical. It occurred to me that it would be a pity if two institutions in the same community should be claiming recognition as desirous of founding a museum when one of them had already a nucleus of a museum in hand, and when by union the objects of both could be realized with greater ease.

Just one word more before I come to the subject proper, and this by way of encouragement, to undertake the collection hinted at. The older members of the Association will remember that, when we took up house of our own, after having lived for many years in tents as it were, our properties available for museum purposes consisted of a few old boxes of fossils and minerals, a moth-eaten emu, a dilapidated flying squirrel, a spiny fish (the ornithorinchus), an old owl, a large wasp nest, a copy of the Breeches bible, and a few sundry curios.

And now we see what has been added, largely without much effort, an indication I think of what might be in a few years hence if we lay down a plan and vigorously carry it out.

It is hardly necessary for me to say anything in such a meeting as this upon the advantages of such a work as I trust our Association desires to encourage by means of a museum. We will, if you please, take that for granted.

The formation of such societies as ours in all the principal centres of population in the country, and not only on this western continent but in all lands in which anything like intellectual culture has a hold upon the people, is a proof that they fulfil a national want in the human mind in its present stage of development. The steady increase in the number of these societies—for they are mostly the offspring of the latter half of the present century—shows that this want is becoming more keenly felt as time goes on. I find out of sixty-three societies affiliated with the British Association, which is to meet in Toronto next year, no less than forty-eight of them had their origin since 1850. I have not been able to get the statistics of kindred societies in the United States and Canada, but it would

be found to be as true of them. I may therefore safely say that societies for the study of natural history are the growth of our own age, and I think a sign of its intellectual advance.

I must, however, remember that it is not of our society generally that I have to speak to-night, but of one of the methods by which it proposes to carry on the practical study of natural science by the formation of a museum, or more especially as to the value of *our* museum as a means of education.

Of the *general* value of museums—using the word in its widest sense as collections of works of art and of nature—in the intellectual advance of mankind, there can be no question. How could art make any progress, how could it even exist, if its productions were destroyed as soon as they were created, if there were no museums, public or private, in which they could be preserved and made available to mankind now and hereafter? How could science be studied without ready access to the materials upon which knowledge is built up? In many branches of science, especially those called *natural history*, the progress was mainly commensurate with the abundance and accessibility of such material. Though the first duty of museums was without question to preserve the materials upon which the history of mankind and knowledge was based, I have noticed in the numerous succession of essays, addresses, lectures and papers, constituting what I may be permitted to call the museum literature of the last twenty or thirty years, the gradual development of the conception that the museum of the future is to have for its complete ideal not only the simple preservation of the objects contained in it, but above all, their arrangement in such a manner as to provide for the instruction of those who visit it. In other words, the value of the museum will be tested not only by its contents but by the *treatment* of those contents as MEANS OF ADVANCING KNOWLEDGE.

I suppose the first recorded institution which bore the name museum, meaning a temple or haunt of the muse, was that founded by Ptolemy Soter at Alexandria about 300 B. C., an excellent paper on which was read before this Association several years ago by Mr. Glyndon. But that was not a museum in our sense of the word, but rather in accordance with its etymology, a place appropriated to the cultivation of learning, or which was frequented by a society or academy of learned men, devoting themselves to philosophical studies and the pursuit of knowledge.

Passing over (for time will not permit) the slight indications left of the existence of collections at all resembling our modern museums among the ancients, we find with the revival of learning in the middle ages, the *collecting* instinct inborn in so many persons of various nations and periods, but so long in abeyance, spring into existence with considerable vigor, and a museum, meaning at that time a collection of miscellaneous objects as well as natural curiosities, often associated with a gallery of sculpture and painting, became a fashionable appendage to the establishment of many wealthy persons of superior culture. As far as I can ascertain, all the earliest collections comparable to what *we* call museums were formed by and maintained at the expense of private individuals—sometimes physicians, whose studies led them to a taste for biological science.

I find also that great merchant princes, whose trading connections afforded opportunities for bringing together things that were considered curious from foreign lands, made collections called museums. Sometimes ruling monarchs, in their private capacity, had tastes running in that direction. In every case, however, these collections were maintained mainly for the gratification of the possessor or his personal friends, and rarely, if ever, associated with any systematic teaching or public benefit. In England, the earliest important collectors of miscellaneous objects were the two John Tradescants, father and son, the latter of whom published in 1656 a little work called "Museum Tradescantianum, or, a collection of Rarities preserved at South Lambeth, near London." I once saw a copy of this work, and the wonderful variety, and in many instances incongruous juxta position, of the objects contained in that collection, made it very amusing reading.

Upon the association of individuals together into societies to promote the advancement of knowledge, these bodies, in their corporate capacity, frequently made the formation of a museum part of their function. The earliest instance of this, I suppose, must have been the Royal Society, who had a museum in Crown Court, London, as early as the latter part of the 17th century.

But however interesting it might be to pursue this historical part of the rise of the museum, to keep this paper within due bounds, and have time for discussion at the close, I must content myself with the two instances named.

As far as I am able to find out, the idea that the maintenance of a museum was a portion of the public duty of the State, or of any municipal body, had no where entered into the mind of man at the beginning of the last century, nor indeed to any large degree at the beginning of this century, for that matter. Even the great teaching bodies—the universities (whose museums are now next to the national ones, the most important in the country) were slow in acquiring collections. Of course it must be remembered that the subjects considered most essential to the education they then professed to give, were not those which needed illustrations from the objects which could be brought together in a museum.

It is also worthy of remark, that notwithstanding the multiplication of public museums during the present century, and the greater resources and advantages which many of them possess, which private collectors can not command, the spirit of accummulation in individuals has happily not passed away, although naturally directed into rather different channels than formerly.

The general museums or collections of old time were now for the most part left to governments and institutions, which afforded greater guarantees of their permanence and public utility, while admirable service was done to science by those private persons with leisure and means, who, devoting themselves to some special subject, amassed the materials by which its study could be procured in detail, either by themselves or by those they knew were qualified to do so. These collections, if they fulfilled their most appropriate destiny, ultimately became incorporated by gift or purchase in one or other of the public museums, and then served as permanent factors in the education of the nation, or, I might say, of the world.

The great national State supported museums which now exist in every civilized country had certain definite purposes in view, and methods of management which it is quite unnecessary for me to discuss now, for I want to speak of local museums and not national ones.

No provincial or local institute could endeavor to enter into competition with them, especially in the means they could, or ought to supply, of advancing detailed knowledge by exhaustive collections in every subject. To the extent of such an institution as the British Museum, or those great museums on this continent, such as the

Smithsonian Museum at Washington, or the one at Ottawa, which is but in its infancy, I say to the extent of these there should be no limit but those imposed by nature herself.

In the case, however, of all other museums, large or small, belonging to a town, institution, society or school, the first consideration in its establishment should be, to have some definite and limited object or purpose to fulfil, and the next, that means should be forthcoming not only to establish it but to maintain it in a suitable manner to fulfil that purpose. Some were enthusiastic enough to think that a museum in itself was so good an object that they had but to provide a building and cases, and a certain number of specimens, no matter exactly what, to fill them, and then the thing was done, whereas in truth the work had then only begun.

What a museum really depended on for its success and usefulness, was not its building, not its cases, not even its specimens, but its curator. I look upon it that the local museum, to take its place among the educational forces of the present time, must have a definite object in view. I have already said that the success of such a museum depends chiefly upon its curator and his staff. He is the life and soul of the institution. We might as well build a church and expect it to perform the duties required of it without a minister, or a school without a schoolmaster, or a garden without a gardener, as to build or form a museum and not provide a competent staff to take care of it. I think at this point, and before I more definitely say what I earnestly hope may be done with our museum, I may be permitted to say that even our own little collection, miscellaneous as it is, would not have been in the excellent condition in which we find it to-day if it had not been for the unremitting devotion and painstaking care, I had almost said loving care, manifested by our valued and much esteemed curator, Mr. Gaviller, and with him I would bear testimony to that part of our treasures which is by far the most valuable, viz., the geological specimens that have been brought together and arranged by our honored friends, Colonel Grant, Mr. A. E. Walker and the President.

As I have already hinted, the first consideration in founding a museum is to have a definite object or purpose to fulfil.

What in such a city as Hamilton should be the object? As I have already said, we founded a museum about fifteen years ago,

and as far as I know this is the first time that the object and purpose has been discussed, but it is not too late.

Instead of a general miscellaneous collection of all kinds of curiosities thrown indiscriminately together as we find in the old fashioned country or city museums, I suggest that we confine our endeavors to two distinct objects, and two only (well, so that we have not to throw any of our specimens away, say three), resolutely refusing to mix them together or destroy the value of either by introducing into them specimens which however precious or interesting in themselves would detract from or interfere with the special lessons to be derived from either of these two or three series.

The one should be a local collection, in which the natural history, the various animals, comprehending insects, birds, etc., the wild flowers, the fossils, and the minerals of a certain definite area, of which Hamilton would be the centre, would be so exhibited, arranged and named, that any one could identify every creature and plant he might chance to meet with in his walks. We have only to fix our boundary and then the object becomes absolutely definite and limited. Everything not occurring in a state of nature within that boundary should be rigorously excluded. We have already, as I have before stated, made a good beginning with the native plants, and our geological treasures already brought together will furnish a very good representation of our local rocks and fossils. I have no doubt our very good friend, Mr. McIlwraith, would permit us to become his debtor once more for a few duplicate specimens as a nucleus for a local ornithological collection. For entomology we could get a few points from our old and kind friend Mr. Moffatt. The fresh water and land shells of the district would be interesting, and as Mr. Hanham, an old member of our Association once showed, the district is especially rich in these, for he and Mr. George Leslie in a few short seasons actually added several shells not before catalogued as being found in Canada.

Surely among the membership of this Association we have young men with enthusiasm enough and tastes to prompt them to take a hold of this really valuable work, one of the most important we can take up and accomplish.

With painstaking collecting, and the necessary investigating, and a moderate amount of curatorial work continuously applied as

new specimens came in—for it would be a long time before the natural history even of this limited region was exhausted in all its aspect would make that collection one of deep interest to all the intelligent dwellers in the district, and a model to be followed in other local museums.

Natural history in its various branches is now becoming a subject of general education. There is a large class of persons who would in all probability, year by year, as time went on, bear a greater proportion to the general population of the country, who, without having the time, the opportuuity, or the ability to make a profound study of any one branch of science, yet took a general interest in its progress, and wished to possess some knowledge of the world around them, and with the principal facts ascertained with regard to it in at least some portions of it. For such persons, our museum, if arranged as I have indicated, and well organized, would be a benefit to a degree that could scarcely be realized at present.

Of course, while I consider that our first, and in some respects our most important, aim should be to make this local collection, I admit, from an educational point of view, it would be quite inadequate to give a general and consistent idea of the richness and variety of the natural productions of the world in which we live, and for that purpose, in a city like Hamilton, with its high educational status, its Collegiate Institute and Normal College in prospect, we should have another collection, requiring another room, the contents of which must be gathered from every available source. It is upon this part of a museum that the skill, the knowledge, the judgment and the capacity of the museum curator would be exercised to the utmost.

Instead of, as in the former series, we would welcome every addition, if originating within the prescribed limits, it would be one of his principal duties sternly to refuse everything that did not distinctly claim a definite place in the system adopted. It would be necessary in this division of the museum to determine on a general plan for the series—nothing being admitted that did not fall in with it, and this plan should be rigidly kept to.

The number of specimens must be strictly limited according to the nature of the subject to be illustrated and the space available. None must be placed too high or too low for ready examination.

There should be no crowding of specimens one behind the other, every one must be perfectly and distinctly seen, and with a clear space around it. Could we imagine a picture gallery with half the walls partially or entirely concealed by others hung in front of them? Though this may appear to you preposterous, yet this seemed to be still the approved arrangement of specimens in most public museums. If an object is worth putting in a museum it was surely worth such a position as would enable it to be seen. Every specimen exhibited should be good of its kind, and all available skill and care should be spent upon its preservation, and rendering it capable of teaching the lesson it was intended to convey. Every specimen should have its definite purpose, and no absolute duplicate should on any account be admitted. Above all, the purpose for which each specimen is exhibited, and the main lesson to be derived from it should be distinctly indicated by the labels affixed both as headings of the various divisions of the series, and to the individual specimens. Mr. Brown Goode, the director of the U. S. National Museum, puts the point better than I can when he says, "An efficient educational museum may be described as a collection of instructive labels, each illustrated by a well selected specimen."

I have already said that the museum required watchful and incessant care, not only must the specimens contained in it, all more or less perishable in their nature (as we have experienced by having to throw away a large part of one of our entomological collections) be continually looked to, and cleaned and renewed when necessary, but fresh ones must be added to make the different series complete, and they must often be re-arranged to keep pace with the continuous advance of scientific knowledge.

An educational museum could not stand still or it ceased to be of any value. It would have to keep abreast of the rapidly flowing stream of knowledge. Now that could not be done without continual expenditure. If we are to have a museum which will fulfil its highest purpose we must face that question.

Our museum, even in its present form, exists because of the voluntary care bestowed upon it by the gentlemen I have already named, whose unremitting watchfulness have alone made it presentable and of interest to the general public altogether apart or largely so from any educational feature. But if founded on the lines which

I have hurriedly and imperfectly laid down, there must be a permanent paid curator. Voluntary assistance was valuable, and we have had splendid examples of what it can do, but we cannot depend on that for any long continuance. A museum would never be what it ought or do all that might legitimately be expected of it until the curator's profession was properly remunerated.

This brings me to the last point I wish to make. How was the permanence of a museum like this to be secured? I have said in the early part of this paper that museums were once all the private property of individuals. Then associations or societies of individuals took them up. Now it was gradually being recognized that it was the duty of government and municipalities to maintain them. Nearly all the London societies formerly possessed museums, but as the collections grew the expense of keeping them became a burden, and they had been gradually transferred to government or other institutions.

The marvellous spread of free libraries, partly state supported and rate supported in our Dominion, especially in this Province, which had taken place during the last few years, appeared to be only the prelude to museums maintained in the same way. The underlying idea of a library and a museum was precisely the same. They were both instruments of intellectual culture, the one as much as the other. That idea has been illustrated on a magnificent scale in the great national Library and Museum in London, and on this side of the ocean at Washington in the great Smithsonian Institute, Library and Museum. I hope that we shall soon find that an orderly well arranged and well-labelled museum would be acknowledged as a necessity in any well considered scheme of educational progress. Then the museum and the library would go hand in hand as necessary complements to each other in the advancement of science and art, and the intelligent development generally. A book without illustrations is of comparatively little value in teaching many of the most important subjects now comprised in general education. A museum should be a book, or rather a library of books, illustrated not by pictures only but by actual specimens of the objects named. The great principle of expending public money upon purposes of education, though comparatively new, is now conceded upon all sides. The cost of supporting a few really efficient

museums, of which I hope the Hamilton Association Museum will be one, would be but a trifle compared with the thousands spent upon far less efficient modes of educating and elevating the people.

I have thus, I fear rather imperfectly, indicated what I consider should be our aim in the future management of the museum: 1st. That our first work should be the collecting, naming, classifying and exhibiting of a collection of the objects found in a state of nature in a prescribed area around our city. That adopted by the Biological Section is a circular area, with a radius of twelve miles from the City Hall as a centre. Of course this might be modified so as to make the County of Wentworth the district from which our collections would be made. 2nd. Another series, more general, with a room distinct from the other, as I have indicated, and I would recommend a third room to receive the miscellaneous contributions and donations made to the museum of objects which could not be placed in either of the other two, and of value either as teaching something or having a historical value.

I think I hear you saying how can we do all this when we are crowded now? Well, I answer, we can't do it in our present room, with our present space and present means. I have in the course of this paper, at least by implication, shewn where the means for carrying on the work must or should come from.

And now I must draw this, already too long paper to a close by quoting a few paragraphs from others as corroborative of the opinions I have expressed, to show that if what I have stated as my idea of what our museum should be in its aims be a dream that I am not the only dreamer.

APPENDIX.

In a committee report made to the British Association for the Advancement of Science upon the provincial museums of the united kingdom, it is stated:

"The special objects of a free rate supported museum in a provincial town should be, 1st, To contribute its share to the general scientific statistics of the country by collecting and preserving specimens of the natural and artifi ial productions of the district in which it is situated.

2nd, To procure such other specimens as may be desirable for illustrating the general principles of science, and the relations of the locality to the rest of the world.

3rd, To receive and preserve local collections or single specimens, having any scientific value, which the possessors may desire to devote to public use.

4th, So to arrange and display the specimens collected as to afford the greatest amount of popular instruction consistent with their safe preservation and accessibility as objects of scientific study.

5th, To render special assistance to local students and teachers of science.

Mr. F. T. Mott, a member of the committee whose report I quoted from, in a paper read before the Leicester Literary and Philosophical Society on the "Development of Museums as public instructors." says: "Museums. free libraries and art galleries have this in common, that they are each expected to fulfil two purposes which are somewhat incongruous, and require to be pursued by different methods and very different appliances. Each of these institutions is expected to minister to the wants both of trained students and of the untrained and ignorant public; and the demands of these two classes of persons are so diverse that they must be provided for separately. The free library must have its lending department for the general public, and its reference department for students. The art gallery must have attractive and interesting pictures for ordinary visitors, but it must also have masterly studies for the instruction of young artists. The museum, however, has a still more complex and difficult part to play. It has not only to provide for the diverse wants of students and visitors, but it has also to contribute to the general progress of scientific knowledge. Every museum, at least every provincial rate-supported museum, which is a public and in some sense a national institution has a threefold duty, 1st, to the nation at large; 2nd, to the students of the neighborhood, and 3rd, to the local public. If museums are ever to be more than a confused compound of the curiosity shop and the peep show, which very many of them are at present, this three fold duty must be very clearly recognized and sufficiently carried out."

OUR EDUCATIONAL SYSTEM.

AN HISTORICAL SKETCH.

Read before the Hamilton Association, May 7th, 1896.

BY INSPECTOR J. H. SMITH.

I have taken advantage of the kind invitation of your corresponding secretary to lay before you a brief outline of the evolution of our educational system. We all look with feelings of pride upon its achievements, and although the high altitude of our individual ideals may not be reached, yet taken all in all there can be no reasonable doubt that it has few, if any, rivals for the foremost position. Perhaps I may venture further, and say that it surpasses all in many respects, and seldom falls below their level at any point. This is notably true if we make our comparisons with those on this continent, and measurably so, if made with those of the old world. The circumstances and environment of the people, as well as the forms of government, render it somewhat difficult to make a fair and just comparison, yet the results show that we have a system which when placed side by side with those of other countries (as at the exhibitions in Philadelphia, New Orleans, Paris, London and Chicago), nobly sustained its high reputation, won for itself a permanent position in the van of progressive educational systems, and brought distinguished honors to Canada. A careful study of its development will show that its rise has been wonderful, its progress phenomenal, and its future bright with the signs of a greatly enlarged usefulness. To this phase of the question I therefore purpose directing your attention.

In order to trace this system through the various stages of its growth and development, and to assist us in forming a fairly accurate idea of the sources whence it has sprung, it will be necessary to refer to the early colonial history of this continent. In these

references we shall confine ourselves to facts bearing upon educational matters, and which show quite conclusively that some of the principles underlying our present system were, even in these colonial days, recognized and applied. As early as 1633, a school was opened in New Amsterdam, and in 1638 provision was made, "That each householder and inhabitant should bear such tax and public charge as shall hereafter be considered proper for the maintenance of schoolmasters." This is the first recorded instance on this continent of the application of the principle of taxation for the support of schools. In 1635 the first school was opened in Boston, and in 1642 a resolution was passed by the general court or legislative body, enjoining upon the local authorities the necessity of seeing, "That the children and servants of each family be taught to read fluently the English language, and to acquire a knowledge of the penal laws." This resolution or law was enforced by a penalty of twenty shillings for neglect, and so far as my researches have gone, is the first instance of compulsory education. In 1647 the first legislative enactment in favor of schools was made in Massachusetts, and the Governor of Connecticut declared in 1670, "That one-fourth of the revenue of the State was devoted to schools."

The absence of newspapers, the scarcity of books, and the want of means for rapid transit in these early days, caused public opinion to be very slow in making its influence felt. These hindrances, together with the political excitement that steadily increased in fervency until it led to the revolt of the thirteen colonies, threw the cause of education far into the background, and seriously retarded the advancement of learning. When this unfortunate war was brought to a close, large numbers of faithful adherents and loyal upholders of British supremacy, finding the altered state of their relations to the government distasteful to their feelings and repugnant to their sense of honor, left their homes, and began life as pioneers of civilization, on the northern shores of the great lakes. These loyal people brought with them, not only fealty to England's throne, and a love for British institutions, but a deeply seated desire to rear in this, the land of their choice, a nation that should become one of the brightest gems in the British crown. The only means by which such a desirable end could be attained was that of educating the people, for no nation has risen to an honorable position in the world

without at least having the governing classes well educated, and no nation has attained a high degree of excellence in commerce, or manufactures, or agriculture, without having the benefits of education widely diffused among the masses.

The ruling principle of government in this Province being more democratic than aristocratic in its tendencies, it follows as a natural sequence that the proper education of the masses is a matter of prime necessity. The reign of the common people has steadily advanced in influence, until now, freedom, education and religious equality are the inalienable rights of all. There was a struggle, long and at times very bitter, before these blessings were secured to us, and nowhere are the effects of this struggle to be seen more clearly than in our early educational history. The leading actors in this drama have passed away, but they have bequeathed to us an educational system, of which it may be truly said, that it is a monument more durable than brass or marble, and more noble than the conquest of nations, or the destruction of armies.

To the early educational history of this Province, we shall now turn our attention and endeavor to trace the growth and development of those principles which underlie our present system. Owing to the sparseness of the population, and the poverty of the majority of the people in these early days, only a few private schools were opened. Kingston has the honor of having had the first school of any kind in Upper Canada. In 1785 the Rev. Dr. Stewart opened a school in Cataraqui, now Kingston, in which the study of classics was a leading feature. This was followed by one at Port Rowan, in 1789, one at Niagara in 1792, one at Ancaster in 1796, and one at York in 1798. About the beginning of the present century, other schools were opened, the principal ones being at Cornwall, Sandwich and St. Catharines. These were entirely supported by fees, and were patronized by the more wealthy people.

The Legislature of Upper Canada in 1797 sent a memorial to His Majesty, George III, asking a grant of land for the endowment of District Grammar Schools, and of a Provincial University. In reply to this memorial the Duke of Portland, then Colonial Minister, sent a despatch to the acting Governor, in which he says:—"His Majesty has expressed his gracious intention to comply with the wishes of the Legislature of his Province of Upper Canada in

such manner as shall be judged to be most effectual; first, by the establishment of free Grammar Schools in those districts in whi h they are called for; and secondly, in due process of time by establishing other seminaries of a larger and more comprehensive nature for the promotion of religious and moral learning and the study of arts and sciences."

In accordance with the terms of this dispatch half a million acres of land were set apart for higher education, but it was soon found that even this large quantity, at the prices then current, was quite insufficient for endowing a number of Grammar Schools. This scheme had therefore to be abandoned, and in 1807 an Act was passed establishing a Public School in each of the eight districts into which this Province was then divided, and giving an annual grant in support of the same. A Board of Trustees, consisting of not less than five members appointed by the Governor, were empowered to make rules and regulations for the guidance of teachers and pupils, to appoint, with the approval of the Governor, suitable persons as teachers, and to have the general oversight of all school matters. The location of these schools was fixed by statute. When this Act was first passed its duration was limited to four years, but in 1808 it was made permanent. In 1819 it was amended, and three additional schools established, provision being made at the same time for the free education of a limited number of poor but worthy children, and for the holding of public examinations annually. On the 12th of July, 1819, an Act was passed establishing a Public School in the District of Gore. This school was opened in 1820 in the village of Hamilton, then seven years old. Stephen Randall was the first teacher, a clever, scholarly man, educated by the Bishop of Quebec. Dr. Rae, John Law, James Cahill and Patrick Thornton also taught, and so far as I can learn, followed in the order named. Two more schools were established in 1823, and in 1837 the school in Vittoria was removed to the present city of London. In 1839 the name was changed from Public to Grammar Schools, the principle of local municipal grants introduced, and a permanent endowment of 250,000 acres of crown lands was made. With these changes and amendments the Act of 1807 remained in force until it was superseded by the Grammar School Act of 1853, which brought these schools more

directly under the control of the Education Department. By this Act candidates for the position of head master, other than University graduates, were required to pass an examination to test their fitness for this work, Inspectors were appointed, and in 1858 a Model Grammar School was opened in Toronto for the professional training of teachers. This school was closed in 1863, with the expectation that Upper Canada College would give a good classical and commercial education to its students, and at the same time afford ample facilities for this professional training. This latter hope was never realized, and in 1885 certain Collegiate Institutes were set apart as training schools for instruction in the theory of education and the practice of teaching. Additional legislation, which greatly promoted the efficiency of the Grammar Schools and added to their usefulness, was obtained in 1866, but not without a hard struggle on the part of the promoters. By the Act of 1871 the name was changed to that of High School, and a superior order of classical schools established under the title of Collegiate Institutes. Shortly after these changes had taken place an additional Inspector was appointed, uniform Entrance Examinations instituted, and the principle of "payment by results" adopted. To apply this principle practically some test was necessary. This test was found in the "Intermediate" Examination, which provoked something more than a spirited and generous rivalry among the head masters. The principle of payment by results has wisely been abandoned and the more equitable one based upon the salaries, the equipment, and the average attendance, substituted therefor. The Intermediate has been merged into the non-professional examination of teachers, and more recently into that of matriculation to our Universities. These secondary schools occupy an honorable place in our educational system, and are worthy the most cordial and hearty support of our people. Whether we look at the buildings and equipments provided, the liberal course of study pursued, the quantity and quality of the work done, or the scholarship of those in whose charge they are placed, we feel that they are schools which any people might well be proud to possess, and we honor them accordingly.

In 1816, or nine years after the establishment of District Public Schools, an Act was passed, granting the sum of $24,000 annually, from the revenues of the Province, for the support of Common

Schools. This sum was apportioned among the different Districts into which the Province was divided on the basis of population. The machinery for the management of these schools was of the simplest form and consisted of a Board of Education for each District, composed of five persons appointed by the Governor, and of a Board of three Trustees who were elected annually, on the first day of June, by the supporters of the school. The conditions necessary to establish a Common School were,—that the inhabitants of any town, township, village or place should unite and provide a school-house, furnish twenty scholars, and guarantee a portion of the teacher's salary. These conditions being complied with, a grant not exceeding $100 was paid to the teacher from the money set apart by the Legislature for the support of Common Schools. This Act being an experimental one, was limited to four years' duration. In 1820, the Legislature reduced the annual grant to $10,000, ordered it to be divided equally among the Districts, and repealed the time limit. With these changes this Act formed the basis of the Common School system and remained in force until 1841, when it was superseded by the School Act of that year.

During the interval from 1820 to 1841 a number of special and temporary Acts were passed, some for the purpose of fixing the annual legislative grant, others to convey school sites from individuals to school trustees, while others were for the relief of teachers, who had suffered loss by the defalcations of some of the District treasurers. In all this time little or no progress was made in elementary education, except that the schools had increased in number. According to the testimony of leading public men, and of persons travelling through the Province, the condition of educational matters was simply deplorable. The schools were schools in name only, for to quote from a memorial presented to the Governor in 1835,—"The little instruction given to the children under the name of education has no influence over their morals, does nothing to open or expand their intellectual faculties, much less to direct them on their conduct through life. English reading imperfectly taught, something of writing, and the first five rules of arithmetic, which the teachers we employ are seldom able to explain, make up the meagre sum total of what the rising generation learn at our Common Schools."

Earnest efforts were put forth by a large number of people to advance the cause of popular education; petitions were presented to the Legislative Assembly, on the strength of which committees were appointed to consider the matter, and devise some means of relief, but all these efforts proved futile. The reasons for this failure are so forcibly and clearly stated in a memorial presented to the colonial office in 1832 that I cannot forbear giving you the following extract from it. The memorialists say: "The establishing of places of learning for the children of persons holding situations under the Local Government and a few other wealthy or influential individuals, at great public cost, but placed beyond the control of public opinion, and from which the sons of the yeomanry derive no benefit or advantage, while the exceedingly numerous and very reasonable petitions of that yeomanry for public support to the all important cause of general education throughout the colony are steadily resisted by persons in authority, in and out of the Assembly, and even declared to be unnecessary in the present state of the public finance, has the effect of preventing that steady increase of capable men, fit for jurors, for township and county officers, and for the halls of legislation, whose feelings and interests would be most closely united and identified with the welfare, the happiness, the general prosperity of their native country, and whose minds would (under a better order of things) become fitted for the correct transaction of the public business of the colony by previous observation, study and contemplation." One of the most important of these committees was that composed of Dr. Charles Duncombe and Messrs. T. D. Morrison and T. Bruce, who presented an elaborate report, and a carefully prepared Act in which a comprehensive scheme of popular education was laid before the Legislative Assembly. This met the fate of other reports, and it was not until the Union of 1840 was an accomplished fact that any attempt was made at School Legislation.

In 1841 an Act was passed providing for the establishment and maintenance of Common Schools, and by it an attempt was made to bring these schools under the provisions of the same law both in Upper and Lower Canada. This, however, proved a failure, for in 1843 it was repealed and two separate Acts passed, one for each of the Provinces. This Act, shortlived as it was, is deserving of more than a passing notice, since it indicated the strong current

of public opinion that was setting in, favorable to a greatly enlarged measure of popular education. The principal provisions of this Act were the establishment of a permanent fund for the support of Common Schools, the appointment of a Chief Superintendent of Education, the introduction of the Separate School System, the utilizing of certain portions of the municipal machinery (such as it was at that time), for advancing the interests of these schools, and the formation of school districts. When this Act was under discussion in the Legislature, large numbers of petitions asking that the Bible be made a text book in the Common Schools, were presented to the House of Assembly. These had the effect of raising a strong opposition from the Catholic members, and the government of the day took the somewhat unusual course of submitting one of their own measures to a special committee of the House, to devise some means of harmonizing these conflicting interests. The result of this committee's work, was, that power was given in certain cases to establish separate schools. These provisions have been continued in successive Acts, until finally they were confirmed by the Confederation Act of 1867.

The School Act of 1843, in addition to the provisions contained in the Act of 1841, made the Provincial Secretary, ex-officio Chief Superintendent of Education, with power to appoint an assistant. It also gave authority to the District Councils to appoint County and Township Superintendents, and to establish County Model Schools for the gratuitous instruction of teachers.

In 1844 the Rev. Dr. Ryerson was appointed Chief Superintendent of Education, and in 1846 brought before the Legislature his first school bill, which provided for the appointment of a Provincial Board of Education, the establishment of a Normal School, the appointment of District Superintendents, and levying an equivalent to the legislative grant upon the different municipalities. This Act was found defective in regard to the management of schools in cities and towns, and therefore in 1847 a short act was passed remedying these defects. The next school legislation took place in 1849, when an Act was passed which caused Dr. Ryerson to tender his resignation to the government of the day. This, the Attorney General refused to accept, and took the somewhat unusual course of recommending the Governor to suspend the operations of this Act until such time as Dr. Ryerson could draft another, which from his knowledge and

experience in these matters, would meet the educational wants of this Province. This was done accordingly and the School Act of 1850 became the law of the land. The provisions of this Act were so much more comprehensive in the matter of detail and so much broader in their scope than those of former Acts, that it was looked upon by not a few of the leading men of the times as being almost revolutionary in its tendencies. Among other things it defined clearly the manner of electing Trustees, and the duties and prerogatives of this office; fixed definitely the powers given to the various Municipal Corporations; provided for the appointment of Township Superintendents, and the formation of County Boards of Public Instruction; prescribed the duties of the Chief Superintendent, and the powers vested in his office; and made provisions for the establishment of the Council of Public Instruction to assist in the management of certain parts of the school system. Supplementary Acts were passed in 1852 and 1853, and the consolidation of these was completed in 1858, after which no important legislation took place until, in 1871, the principles of the Charter Act of 1850 were extended so as to meet the increased educational requirements of the time. By this Act, Township Superintendents were exchanged for County Inspectors, the providing of adequate accommodation was made imperative, a uniform standard of examination for all teachers was established, the right given to every child within certain ages to attend school, and contributions to the Superannuation Fund were made compulsory. When radical changes, similar to these, are made in any law, especially if these changes involve an increased expenditure of money, strong opposition to their enforcement is almost sure to follow. This was the case after the passage of the Acts of 1850 and 1871, but now that the good results of these laws are seen in the greatly improved state of the schools and premises, the people naturally feel proud of the progress made and uphold the laws which made these improvements possible. It required a firm hand and a strong consciousness of being in the right to withstand the pressure brought to bear to modify certain provisions of these laws, but Dr. Ryerson possessed the necessary firmness, and our educational interests were greatly benefited thereby.

Two important changes have been made in our school laws since 1871, the one caused by Dr. Ryerson resigning the office of Chief

Superintendent of Education, which led to the abolition of that office and the appointment of a Minister of Education, the other arose out of the necessity of having none but trained teachers placed in charge of our schools. The Normal Schools were unable to meet the demand thus created, and this led to the establishment of ounty Model Schools for the professional training of Public School Teachers. These changes have been productive of great good to our system, have strengthened its hold on public confidence, and have given us unequalled facilities for the education of the youth of our country.

From the brief sketch that I have been able to give of the various Acts that have been passed by the Legislature, from the earliest times to the present, and of the administration of these laws, it will readily be seen that the following principles are the outcome of that legislation, and form the basis of our present educational system. These, briefly stated, are :

1. *That our Public Schools are Free Schools.* This forms the chief corner-stone of our school system, and is the result, on the one hand, of an enlightened public opinion demanding that this principle shall be embodied in our statutes, and on the other, of that intelligent legislation that yielded to this reasonable demand, and made it the law of the land.

2. *That adequate accommodation and properly qualified teachers are provided for every child.* This follows as a natural sequence, for if the schools are free to all, then they should be placed so that they are accessible to all. These two principles embody the idea that the property of the country is responsible for the education of the youth of the country, since the value of the property is greatly enhanced by the diffusion of education among the masses, and conversely, the prevalence of illiteracy depreciates the value of property.

3. *That every child has the right to an education such as will fit him for the duties of citizenship.* This is a necessary complement of of our system of responsible government, for if the people are to pass judgment upon the acts of their representatives in parliament, or take part in the government of the country through our municipal system, or assist in the administration of justice through our local courts, it follows that they must be educated sufficiently well to exercise the rights of franchise, and discharge the duties of a citizen in an intelligent manner.

4. That every teacher is specially trained for the duties of his profession. This is simply the natural outcome of the three principles already mentioned, for if the money expended in providing accommodation and furnishing the means necessary for the proper education of the children of the country be wisely spent, it follows that the education received should be of the most suitable kind, and none but trained teachers can do this work satisfactorily and with the best results.

5. That the general oversight of the Schools is placed in the hands of thoroughly trained and experienced teachers. Like the preceding principle, this follows as a natural sequence, for the work done, even by trained teachers, requires thorough and systematic revision to ensure the vitality and efficiency of the schools, and to give a guarantee to the public that the work, both in regard to quantity and quality, shall be properly done.

6. That the examination of teachers, the courses of study pursued, and the general direction of certain portions of the educational machinery is placed in the hands of teachers of distinguished merit and special fitness for the work. This principle raises our profession to a higher level, and causes it to command the respect of the people at large, for none are so capable of judging of the fitness of men for certain positions, and the discharge of the duties connected therewith, as those who are intimately acquainted with the work. Therefore, it must be apparent that the principle is a sound one, and an additional guarantee that the members of the teaching profession are properly prepared for their work.

7. That the entire system is placed under the guidance and management of a Minister of Education, who by virtue of his office holds a seat in the Government, and therefore under our Constitution must represent a constituency in this Province This is the last principle I shall name, and it forms a fitting completion to the series already enunciated. To every well-wisher of our system it must be apparent that the head of the Education Department should have a seat in the Government; because (1) the educational interests of the country are equal, if not greater, in importance than those of any other department; (2) the schools should be managed in the interests of the people, and therefore their representatives should have among them some person competent to give full information con-

cerning all matters pertaining thereto; (3) the large sums of money granted for educational purposes should be under the control of a Minister of the Crown, who, in turn, is responsible to the people's representatives; (4) as the greater part of the management of our educational affairs is in the hands of, or largely influenced by, the teaching profession, and the people furnish large sums of money in support thereof, what is more fitting, and more in accordance with right and justice, than that the connecting link between the two should be at the head of the Education Department, and at the same time occupy a seat in the Government commensurate in importance with the interests he represents.

This may not be an ideal system, but it approaches as nearly to it as any that has come within the range of my knowledge. The principles which underlie it must commend themselves to every well-wisher of popular education, for they are based upon truth and justice. That phase of education embraced in the term "religious instruction" (a vague and indefinite phrase), in my humble judgment, does not come within the limits of legislative enactments, but belongs to the home and to the Church. Christian education is one of the prerogatives of every true teacher; for, by his walk, his conversation and his daily life, he teaches lessons of greater importance and more lasting value than any lessons he teaches in the prescribed course of study. Teachers may do much in this respect, but it must be left in their hands to seize the opportunities as they present themselves, and impress on the minds of their pupils the great truths of the Christian religion.

We have glanced at the rise and progress of an educational system whose cradle was the log school house of the hardy pioneer, whose infancy was spent in the midst of that political and sectarian turmoil which culminated in the Mackenzie rebellion, and whose youth was nurtured and cared for by the judicious and far-seeing intelligence of that thoughtful educational statesman, Dr. Ryerson, until it developed into early manhood and received an honored place in the highest councils of the nation. That place it holds to-day. In the person of a member of our own profession, into whose hands its destinies have been placed, it is opening up wider fields of usefulness, freeing itself from encumbrances that have been left as legacies of the past, and girdling itself to meet the

demands of that renewed intellectual life that is advancing upon us with all the force generated by the greatly increased mental vigor of the coming generation, the sound of whose footsteps is already heard along the corridors of our educational institutions. We have this system as a part of our heritage, and a noble one it is, for in its scope it reaches down to the undeveloped intellect of the infant in the kindergarten, leading him by gentle steps along the pathway of knowledge for which his soul thirsts, opening up as he advances in years the secrets that lie hidden at the very threshold of learning, and as he grows stronger feeding him from the vast stores of the past until in the full strength of manhood he goes forth to grapple with the great problems of life.

REPORT OF THE BIOLOGICAL SECTION.

Read at the Annual Meeting, May 7th, 1896.

The Biological Section have held regular monthly meetings during the past winter at which we had a fair attendance and pleasant intercourse on subjects of interest to the section.

Our chairman has undertaken the listing of all wild plants found in this district. Of this we shall hear more later.

At one of our meetings Mr. Alexander read a paper on the subject, "Why should we study Biology."

Although this was the only original paper read during the season, our meetings have been full of interest and instruction.

The opening up of the T. H. and B. Railway will make localities formerly distant easier of approach for botanical research.

We start the summer with good intentions to make large additions to the Herbarium and to the other branches of the Museum.

All of which is respectfully submitted.

J. M. DICKSON,
Chairman.

H. S. MOORE,
Secretary.

BIOLOGICAL NOTES.

Read before the Hamilton Association, February 6th, 1896.

BY WM. YATES, HATCHLEY, ONT.

The musk-rat seems to be in several respects a diminutive edition of the beaver, though not quite so communistic. In many places they are known to build huts of coarse sedge grass, which are situated at some distance from the banks of shallow streams: but these animals show considerable adaptability in choice of residence; for where the stream is characterized by high loamy shores the musk-rat shows a preference for excavations whose ingress and egress is mainly below the usual water level of the stream, and when a watercourse is of the size and permanence as regards non-liability to dry up in summer season, the rodents often increase in numbers to such an extent as to commit considerable depredations upon such farm crops as grow in the vicinity.

Many of our neighbors have made complaint of the damage to corn fields, both in the stage of early cereal growth and also when the forming ears are in a sweet and succulent state. Field carrots also suffer from their ravages, and full-grown musk-rats are frequently seen swimming the creeks, on the way to their rendezvous, carrying huge mouthfuls of green clover stalks in the succulent state of blossom. They also visit the apple orchards when the ripe fallen fruit abounds, and have been known to visit barns where heaps of sweet apples had been temporarily stored. The hunters declare that the musk-rat burrows are generally too deep and too much ramified for successful raiding by the digging out process, and trapping or shooting are the most general appliances for capture.

In one of our recent abnormally dry autumns, when the water in the channel of our local creek had dried up, except in a very few of the deepest parts of the channels, and near to this limited area of water supply there seemed to be a concentration of musk-rat popu-

lation in the holes in the bank. Some industrious spade work was therefore resorted to, and this, supplemented by canineefforts, resulted in the capture of eleven musk-rats and one mink—the latter seeming, for the moment at least, not on unfriendly terms with his semi-aquatic associates. Great numbers are annually captured for the sake of the skins, and yet the musk-rat population seems to remain undiminished ; and these rodents hold their own status better than most of the original quadrupeds that cultivation and the clearing of forests have thinned off.

The Canadian otter, too, was once a common inhabitant of our creeks and large rivulets, and some of the settlers remember the time when the splash of the otter as he jumped off the edge of the plank bridges into the water at road crossings was a quite common incident, and *otter slides*, or runs, down the steep banks of streams were common phenomena during the deep snows of winter. The last otter capture that we have heard any report of in this locality was made by an acquaintance of the writer in May, 1863. With the drainage progress of the country, and consequent disappearance of the supply of fish, otter existence has become an impossibility.

The musk-rat does not seem to possess the robust burrowing power of the groundhog, but prefers to domicile itself in the loose earth near bridge embankments, and its subterranean operations are frequently the cause of the giving way of mill-dams in flood-time, also the culverts on railways are often rendered insecure by the musk-rat excavations in proximity to the timber or masonwork, and they are hated pests to railway section men and hydrographic engineers.

In the vicinity of a wooden bridge that crosses a stream near this place, it is an entertaining sight to watch the playfulness and gambols in the shallow water of a family group of juvenile musk-rats towards the end of the month of June. Their romping and sport is as rollicking as that of kittens or puppies in warm sunshine, but on the approach of an intruder an instant retreat to their semi-aquatic refuge is accomplished. The roots of the cat-tailed sedge, and also those of the pond lilies are relished by these rodents and are frequently stored in their hybernaculum for winter use. On one occasion last summer a large hawk had noticed the "water polo like" amusements of the rodent family party alluded to above, and

made a dash into the edge of the stream to secure a victim, but disturbed perhaps by our sudden approach through an opening among the trees, Mr. Falco was foiled in his aim and darted away in very evident chagrin at his luckless fiasco.

The grace and ease of the musk-rat's underwater movements are admirable! Even in April when the waters are cold from the recently melted ice of winter, we have noticed them rapidly progressing along the bottom of streams containing one or two feet depth of water, and occasionally stopping in their course to take a nibble at the submerged succulent roots of the plants mentioned above. Their semi-webbed feet and scaly-vertically flattened tail and their coat of dense moisture-resisting fur, enables them to find evident enjoyment in the plane of life in which Providence has placed them.

The musk-rat is believed to produce young but once a year, and as many as eight have been known to have been given birth to at one litter. The female frequently has a habit of going away from the family rendezvous just before the time of parturition, and making a new nest near by under a big heap of logs or in a rocky hollow, to give birth to her progeny in as much seclusion as is attainable. This instinct of sequestration is supposed to give security against the non-too-affectionately inclined propensities of the old males of the species towards the younger fry, whom they with farsighted malignity seem to regard as embryo rivals and competitors.

A number of instances are on record in this vicinity where about the beginning of May the female pregnant musk-rat has been met with, in the hour of darkness, on such a quest; and they are very irritable and pugnacious at such a juncture, and bravely attack large quadrupeds, such as colts or young bovines that happen to cross their path, when on this errand of concealment intent.

Like the spaniel dog, the musk-rat on leaving the watery element after a swimming or diving excursion is prone to give itself a thorough and vigorous shaking, and can then enter its cosy resting place in warmth and comfort.

RAPTORES.

As in several previous years large hawks have been seen during the month of December just passed. On last Christmas day (the weather being mild) my son, who, with his small terrier dog,

was walking along the highway opposite to a piece of woods, a large hawk was seen on the roadway struggling with a full grown ruffed grouse, which had apparently just been stricken with the hawk's talons when in rapid flight across the clearing. The hawk was soon driven from its prey by the hostile demonstrations of man and dog, and took immediate flight to the high branch of a neighboring tree, but its victim the grouse had received mortal injuries, and died immediately afterwards in the hands of the human interrupters of the fray.

This incident suggested the reading of the old time legends of the art of falconry, and exemplified the wonderful velocity of flight of the hawk species. Although the grouse family are endowed with great muscular power of wing when pursued by the large hawks, they have little or no chance of escape in the clearing; for in a straight unimpeded flight the falcon is sure of his prey, and the only chance of the fugitive is in twists and angular progress among branches or boughs. No accurate idea of the hawk's wing power can be formed from watching the bird's flight when circling aloft in its pride and recreation near the clouds in spring time. Their speed of motion when about to seize their prey must be seen to be realized, the very air hums with vibration when they swoop down in a diabolic curve on the object that they wish to appropriate, and every nerve and sinew, and plume and quill, is strained to the most desperate tension, and failure is almost out of the range of possibility.

These non-migrating hawks prowl about the bush haunts of the ruffed grouse, and live well where the latter are numerous; for they have, when the snow is not deep, to search on the ground for food in the open beech or maple forests, where their capture by the hawk is easily accomplished; but when the snows become deep, and the grouse have to depend for food supply upon the buds of the aromatic birch-shrub, and a precarious assortment of bush-berries, the thickets are a protection from the assaults of their powerful winged enemies. Such is the dread of the ruffed grouse of the falcon tribe that quite a number of instances have been reported of the grouses flying into houses, or into the open doors of barns (where men have been working) in mortal fear when pursued by their fiendish foes.

Not very long ago one of these December or winter-lagging hawks swooped down in the poultry yard of the writer and struck its

talons into the body of a fine guinea hen. We, who witnessed the "coup"—cudgel in hand—took part in the fracas, and only after some wild and random striking and pursuing, and sensational shrieking on our part, was the sanguinary aggressor driven away.

It may serve to give an idea of the velocity of the flight of birds of prey, when swooping at an object, to mention an incident that occurred several summers ago, in the garden of one of our neighbors. A number of half grown tame ducks were wandering among the vegetables, among which rank weeds had been growing, but some of which had been mown down with a scythe a day or two before the date of our incident. A large hawk was seen suddenly to strike down at one of the ducklings, but striking its breast against one of the prostrate stems of the big weeds, was firmly impaled thereby, and notwithstanding its violent struggles was soon captured, when the force of the impact was found to have driven the bayonet-like weed stem lengthwise through the abdomen of the bird, and protruding some distance beyond the caudal extremity of the body. The swoop of the shrike is equally impetuous in its less powerful sphere, for a number of instances have occurred within one's ken in this district where cage birds have been struck at, but where the aggressor was killed or stunned in the onset by intervening cage wires, or by window panes. A curious instance of the capture of the cunning crow who formed one of a group of ornithic marauders that lately trespassed in a field of ripening corn two and half miles distant from here. On the crows being suddenly interrupted by the farmer, one bird in his precipitancy got his feet firmly entangled in the meshes of the twine-like stems of the wild bind-weed (convolvulous arvensis), or polygonum sagittalum, and was clubbed to death as the penalty of his freebooting activity, or else of his clumsiness.

The flocks of snow buntings have been more frequent visitors and also more numerous this winter than is usual about here. One individual of this species was shot by an acquaintance a short time ago, and the body of the bird was found to be almost a perfect mass of fat. These birds were reported of about here in the month of November last, and are now seen on the fields around Hatchley almost every day. One flock seen yesterday was estimated to consist of scarcely less than a thousand individual birds. And what a beautiful ornament do these gracefully moving objects lend to the

wintry landscape! It is always by their presence "touched off" with magnificence. They seem a perfectly integral part of the appointments of the snowy expanse. Their movements, too, seem rhymically ordered, and at certain bends in their flying evolutions around the fields, twinkling musical "calls" are uttered, seemingly as aids to conformity of the regulations, and to preserve the unity of organization in the vast multitude. There are some very weedy fields about here, and the snow-birds revel from hour to hour among the tall seed-laden dried stems of various species of cheopodiacean and compositæ that human negligence has permitted to intrude in our cultivated areas.

A neighbor, who keeps a large flock of geese, informs me that occasionally, when the latter are swimming on the waters of the large creek which meanders through his farm, a musk-rat will appear near, swimming rapidly on its way to its rendezvous burrow in the adjoining banks, and the geese seem to be aware that the intruder on their demesne is no carnivora, but merely requires "a right of way," and the geese show no terror or alarm, and but little mistrust at the big rodent's proximity; but should that semi-aquatic feline, the mink, invade the precincts, there is much noisy protest and trepidation manifested, for the mink is in bad odor with the whole feathered tribe, both on land and water.

The aroma that accompanies the musk-rat seems to have been intended as a protective influence, and appears to be somewhat under the control of the quadruped as to its diffusion and volatability; for when these rodents are suddenly disturbed or interfered with, when on land, and especially when they are in a combative mood, the scent spreads around with extra vigor, and the rodents are said "to throw their musk" in a defensive way, similar to the ruse of their unnamable cotemporary of the sable and white streakings.

Another observer, whom one could name, states that the musk-rats appropriate quantities of his growing wheat crop when the grain is in the succulent or milky stage of ripening, and he sometimes shoots them as they are retreating from the field and carrying off large mouthfuls of the straw and grain to their subterranean dwelling places in the creek banks. And near to the farm of the individual just alluded to, there is a large barn situated at the edge of an apple orchard, the owner of which made complaints that "rats" were

"gnawing" his bins and granary partitions in an unusually destructive manner, and a very energetic terrier dog was procured and placed on the scent of the depredators, with the result that a large musk-rat was dug out from its cosy retreat in the middle of the hay-mow, and it was supposed that a quantity of apples that had been temporarily stored in the building was the attraction that had tempted the abnormal guest to his destruction.

A number of years ago the pelt and fur of the mink had a much higher trade value than is the case at present, and some of our neighbors devoted much time and effort in the winter time to the trapping business as was avowed with good paying results, and at the same time poultry enemies were gotten rid of. A neighbor, whose flock of ducklings was nightly or daily diminishing, kept close watch one day from an ambush place at the edge of the duck pond, and soon saw the mink enemy swimming rapidly in rear of the retreating and quacking mother-duck and her numerous progeny of two weeks old. As the black enemy had approached almost to within springing distance, the old duck dived, but the little ones exerted all their powers of foot and winglets on the watery surface, and but for a bullet from the poultryman's rifle, which ended the mink's career, the waterfowl's family would soon have been one or two less in number.

With the hero of the above adventure we were well acquainted, and we had entire faith in his truthfulness, and may now transcribe another of his narrations.

One warm spring day, whilst roaming in his own woodland territory, his dog began to bark and gnaw at the partly upturned roots of a tamarac tree in the swamp, under which further search disclosed the cosy nest of a mink containing eight young ones seemingly less than two weeks old. The mother mink was near by, watching the fate of her little ones from a safe recess in a hollow stump. Our acquaintance at once removed most of the nest material and the eight young minks, and placed the same in a large box in an outhouse adjoining the kitchen of his house and which was 200 or 300 paces distant from the spot where the mink nest was first found. Over the box he placed as a cover several loose pieces of board. His intention was to try to rear the young minks in the manner of kittens, which he believed could be accomplished "by hand," as he expressed

the idea. But during the first night of their incarceration the parent mink made a visit or visits to the shed and succeeded in pushing one of the pieces of board covering aside and in removing the entire group of her young to a locality more congenial to the original idea of mink destiny. The man was convinced of the truth of this explanation of the vacancy by the tracks visible in the sawdust by which the floor of the woodshed was bestrewn, and also, he said, he had been disturbed in the night by the continual barking and restlessness of his dog, who was confined by a secure chain in a kennel about seven or eight paces from the scene of the mother mink's affectionate operations.

The minks are mostly nocturnal in their movements, and in their mating season, late in February or early in March, have been traced on newly fallen snow four or five miles in a single night. They seem to have the faculty of being able to remain under water for one or two minutes at a time, and when hotly chased will dive under icy surfaces to reappear at almost incredible distances from the point of vanishment. Like the musk-rat, the mink has favorite retreats in rear of the timbers of bridges and culverts, and in such dens and cavities scores of frogs' bodies are sometimes found that the mink family circle had stored for winter supply.

One day last summer, whilst engaged hoeing corn, a fresh mink track made during the night previous was noticed by a friend of the writer of this, and a little scrutiny revealed the fact that Mr. Mink had come from its home in the nearby woods to visit a well that was daily made use of for the purpose of supplying water to farm stock. The well was enclosed by a framework of boards two feet high, and the water level was three or four feet below the surface of the ground. The mink had apparently made this surreptitious visit to capture a good sized batrachian, who for a number of weeks previously had had its contented home in the well, and which after this proven visit of its natural enemy was no more seen of human eyes. The mud puddles about the well, and water splashes on the boards gave indubitable proof of the mink's proceedings, and the missing frog—it would perhaps be a "bull" to term an object lesson.

Once when performing statute labor on a new piece of road through a swamp, we nearly stumbled on the nest of a ruffed grouse containing twelve or thirteen eggs on which the old bird had been

incubating. Several days afterward we visited the spot to notice proceedings, when lo! nest and eggs had been destroyed, and we were informed by a bystander, who had been working near, that he had seen and chased a mink running away with a ruffed grouse in its jaws. He said the bird looked so big, and its captor so small, that the incident made him think of a cow carrying a haystack away on its head and horns.

(A line or two by way of addenda to the few remarks about "the Canadian otter" in the last communication.)

Nearly fifty years ago it was a common incident to find the end surface of the planks of the bridges of our roadways every morning besoiled by the dejecta of the otter. These dejecta were mainly composed of the bones of the sunfish and similar small denizens of the inland streams of that period. [We, in common with every traveller at that period, have seen many of those heaps of excrement on the road bridges' edge, and on enquiry were invariably assured that they were the focacal matter of the otter.] The otters seem to have had a habit of sitting on the edge of the bridges, and springing therefrom at fish appearing on the surface of the water. A number of people, on whose word we place full confidence, asserted that they had many times, on moonlight nights, seen the otters plunge in the water on the approach of man or team on these occasions. We, ourselves, remember seeing what were termed "otter slides," down the snow-covered slanting banks of the creeks about the same period. These "slides" resembled tracks that might be made by drawing a small round log through the deep snow, and there were generally spots near where the swiftness of the current had prevented the streams freezing entirely over.

It was a tradition among hunters that there were but few dogs bold enough to attack the otter, who, it was averred, had a double row of grinder teeth, and could use them with murderous power on his canine or other assailants.

NOTE.—The visits of the large flocks of snow buntings have of late been less frequent than was the case a month ago. Last Friday (24th instant), when the thaw and sleet storm was raging, or at its height, a large flock of the birds fluttered and hovered about our fields for an hour or more, occasionally alighting at the edge of some of the flooded depressions in the

arable surface, as if for the purpose of drinking, but on closer observation seeds of various* species of grass and weeds were noticeable, floating like a sort of scum on the margin of the little pools. These seeds, which the buntings go in quest of, were undoubtedly the objects that attracted the birds here on the occasion referred to.

* The seeds of panicum crus galli, setaria glauca, chenopodium album, and of plantago major, are, on dissection, sometimes found in the crop of these birds.

WAYSIDE NOTES.

Read before the Hamilton Association, May 7th, 1896,

BY WM. YATES HATCHLEY, ONT.

On travelling northward from Toronto, the undulations of the land frequently afford extensive views from the railroad car windows, and the soil is seen to yield good crops, and fruit orchards are a prominent feature of the landscape, and the frequent stoppages of the train at numerous towns and villages, and throngs of well-dressed passengers that get on or off the train indicate a general state of contentment and prosperity.

There is a continually ascending grade until Lake Simcoe becomes visible, and even onwards until the towns of Allandale and Barrie have been passed, then, a few miles northward from the latter place, the small streams that the railway crosses may be seen to have their currents directed towards Georgian Bay, on Lake Huron. Soon after passing New Lowell station, on the Meaford branch line, high and continuous ranges of dark-tinted hills may be seen both to the right hand and to the left looming up at a distance of several miles. On the western side of the right hand acclivity runs meanderingly northward of the Nottawasaga river to its debouchure in Lake Huron, where the coast has a large semi-circular trend and a picturesque beach whose crescent line is margined with a light forest growth of cedar, etc., for a sweep of nine or ten miles.

The above mentioned ranges of hills are continuous through the county of North Simcoe for a number of miles, and enclose the wide valley of the Nottawasaga creek, and other small affluents. And as we travel along the road that leaves the lake beach and go southward towards Barrie, a number of low escarpments are observable, which seems a strong indication that the waters of the Georgian Bay were at some by-gone period at a much higher level than is the case at present. There is a wide extent of flat country forming a

large portion of Sunnidale township and a part of the township of Nottawasaga, which seems to have been inundated at some former period, and lofty dark looking hills, which bound the landscape at a distance of several miles on either hand, seem to have once formed the shores of a watery expanse. Sunnidale township has a generally flat appearance, as level in fact as Burford Plains, in the county of Brant, and in the area of two concessions of Sunnidale extensive deposits of shell-marl exist; and in these localities immense numbers of small lacustrine shells may be gathered among the material excavated from the roadside ditches. These shells are longish spiral in form, and are, like the marl in which they are imbedded, of a light grey or whitish color, and seem identical with similar shells which now bestrew the water's edge all along the Nottawasaga beach; and the slowly retreating waters of the Nottawasaga stream have formed vast swamps of some hundreds of acres in extent near the foot of the hills of Vespra township, a few miles from where the said stream debouches into the Georgian Bay.

Some well diggers in Sunnidale township made use of the expression in our hearing, "This is all made land;" and related that in the labors of their vocation trunks of large trees—still very slightly decayed—were very frequently met with at a depth of twelve to fourteen feet from the earth's surface.

The waters of Georgian Bay, when agitated by violent northerly winds, and especially when encumbered by floating ice-masses in spring, during past centuries seem to have made great inroads in the coast line. Bluffs seem to have been battered down, and the soluble material carried out by the roily waters, and deposited at some greater or less distance from the shore, whilst the heterogenous boulders are thickly stranded and in great variety as to size and composition, protrude above the surface of the shallow waters of the gradually shelving shore.

Similar action of the elements has been, and is yet, going on along the northern shore of Lake Erie. (The truth of this observation become very palpable and conspicuous to an observer who lately visited the latter locality after an absence from the well remembered scenes of about forty years.

As we trace the Georgian Bay shore in an easterly or northeasterly direction from the town of Collingwood, low ridges of coarse

gravel upon which a scrubby thicket of deciduous trees and shrubs seems struggling to establish itself; said ridges are in some places quarter to half a mile in width intervening between the water's edge and the true lake shore, on which a mixed growth of conifers and of hardwood forest still exists. But as we leisurely passed along seated in the carryall no striking botanical or orinthological novelties were observed. Doubtless, so late in September (17th), a majority of the feathered songsters had migrated southward, but the goldfinch or Canadian yellow-bird was still abundantly in evidence, also the brilliant tinted bluejay and two or three of the commoner species of woodpecker.

As to shrubby vegetation, the stag horn sumach (Rhus. typhina) was very widely diffused among the willow scrub, also the Labrador tea (Ledum latifolium) and two species of Potentilla, to wit., P. Norvegica and P. fruticosum, were seen in a number of spots on swampy margins, also the tall Jerusalem artichoke was occasionally seen still sporting its flowers (but may have escaped from cultivation).

The pest of Canada thistles, from some unexplained cause, seemed much less troublesome, either in cultivated grounds or on the margin of the highways, than is the case in Brant or Oxford counties.

Farm crops in the Collingwood region were at least two weeks later in ripening, but yielded an abundant harvest in 1895. At the time of our visit, a number of fields of oats and peas were uncut and generally presented a luxuriant appearance. And the winter wheat crop, which had been already threshed, was commonly spoken of as an exceptionally heavy yield. Fruit returns were also quite favorably reported of, and apple and plum orchards were said to have been prosperous, at any rate within a few miles of the modifying influence on temperature of the waters of Lake Huron and Simcoe.

Yet, one troublesome weed that was complained of as causing loss and trouble to the oat and barley cultivators was seemingly Amaranthus hybridus. The September asters were in flower in profusion about the bog margins, but neither they or the Solidagos or yet the sedges presented any marked differences to a casual observer. to the species of the same genera that are so common in south-western Ontario.

In travelling from New Lowell towards the west, a rough broken piny region several miles in width, and in many of its features resembling the country around Otterville, in South Oxford, is passed through, but much more fertile land, and also more hilly, is travelled over as you approach the thriving railroad village of Creemore, which village consists mostly of excellent brick stores, churches and dwellings, and in picturesqueness of situation and environment reminded one of the village of Elora, in the County of Wellington. Creemore is situated at the foot of the Blue Nottawasaga hills, which here have a steep rise of several hundred feet, but whose sides are alluvial and fertile. From Creemore to Avening, two or three miles north-eastward, the country is undulating and well cultivated, and at the latter place an individual was interviewed who is of local notoriety as a cultivator of the honey-bee, and who bore the appropriate name of Honeywood. This individual, who seemed in quite comfortable worldly circumstances, informed us that his bees had scarcely come up this season to the average yield of honey, and out of the hundred colonies in his possession not a single successful swarm had come off during the summer of 1895, which was characterized by a number of unusual traits as to temperature and scantiness of rainfall.

During the hour of our evening's detention at Avening we heard several rifle cracks in an adjoining piece of woods, and presently two young men emerged one of whom was carrying the bodies of three ruffed grouse in his left hand.

REPORT OF THE GEOLOGICAL SECTION OF THE HAMILTON ASSOCIATION FOR THE YEAR ENDING MAY 7TH, 1896.

The section, in submitting this their annual report, desire to state that steady progress has been made in advancing the interests of the section.

That the few members who have met from year to year and carried on the work, have reason to be proud of the position to which the section has attained among sister societies who make geological work their aim and study. Last year we referred to the subject of fossil sponges of the Niagara formation, and alluded to it as being the means of drawing the attention of scientific men to the almost inexhaustible stores of this particular fauna, and that the section was credited with three new genera and seven new species, with a probability that these numbers would be increased as the work of examining the specimens proceeded. This year, through the persistent efforts of Col. C. C. Grant, the section has again been brought into prominence. The very large number and variety of the graptolites obtained from the Niagara rocks at Hamilton have attracted the attention of eminent scholars, among whom is Prof. R. Gurley, of Washington, D. C., who is busy preparing a work on the Graptolites of North America, and who has from time to time asked that specimens be sent to him so that the work will contain as complete a list as possible, properly illustrated and described, of the fossil graptolites of North America. Col. Grant has sent a very large number to Prof. R. Gurley during the past year, and we doubt not that this locality will be well represented in the work.

There is yet another source from which the section can wiew with some satisfaction the appreciation by outsiders of the result of our patient endeavors to keep our section before the world as an institution worthy of the Hamilton Association. This new avenue is the result of a personal visit to our museum of Prof. Schuchert, of the Washington Museum, D. C., who has now under preparation

a work on the North American fossil star fishes, and asks the loan of such specimens as we have in our collection.

A request has also been made by one of the geological staff at Ottawa (Mr. Ami) to send him the printed proceedings of the Hamilton Association, particularly those numbers which contain papers on geological subjects, because he is engaged writing a bibliographical work on the paleontology of Canada, and wishes to include the names of the authors of papers on geology and subjects treated in them.

During the year just ended there have been many specimens added to the museum, particularly from the Niagara and Clinton formations at Hamilton.

A very liberal donation of miocene fossils from the museum at Washington, D. C., has been added to our collections, obtained through the influence of Col. C. C. Grant.

The Chairman, Mr. A. E. Walker, has presented to the section a carefully prepared profile drawing of the cutting on Hunter street, extending from Park street to Queen street. It shows the various strata throughout, and indicates points where animal and vegetable deposits were found.

Papers of geological interest were read at all our meetings, and it is a matter of regret that more of the members do not avail themselves of the opportunity to attend these meetings and take part in the proceedings.

Following are the dates of meeting and the subjects of papers read:

Nov. 22nd, 1895, Geological Notes on the Grimsby Ravine. Col. C. C. Grant.

Jan. 24th, 1896, Geological structure, as represented by the tunnel on Hunter street between Park and Queen streets, by A. E. Walker, Chairman.

Feb. 28th, 1896, Answer to Geological Critics. Col. C. C. Grant.

March 28th, 1896, Notes regarding our local Graptolite. Col. C. C. Grant.

April 24th, 1896, Geological Notes on the Pipestone District, Manitoba, by Jas. A. Denoghy.

Respectfully submitted.

A. E. WALKER,
Chairman.

A. T. NEILL,
Secretary.

GEOLOGICAL NOTES.

Read before the Geological Section of the Hamilton Association, Nov. 22nd, 1896,

BY COL. C. C. GRANT.

The recent visit of Prof. Chas. Schuchert, Curator of the Paleontological Department, National Museum, Washington, U. S. A., author of an able paper on the "Classification of the Brachiopods," induces me to think that a short account of our proceedings here and at Grimsby may not prove altogether uninteresting to the geological section of the Hamilton Association. I was about to leave for Winona when I received Dr. Gurley's letter informing me the curator was proceeding on a collecting tour, and intended to pay Hamilton a visit. His arrival seemed so uncertain, I went on, leaving a few parcels for him containing what I considered some new species of Graptolites, and giving directions to let me know at once, if he called during my absence. I ascertained on my return he arrived the day before, got the fossils, and had gone to Toronto, but was to be back in a day or two. When he returned on Monday, I took him to "The Hamilton Museum," after we selected some specimens from my private collection. He passed a considerable time in examining our characteristic local fossils, the Clinton ones especially Arthroclema, an undescribed species, probably the colored Lingulæ, Dr. Jas. Hall's Posidonia, and the plants of the series.

On coming to the case containing the Niagara specimens, he recognized some of the Tennessee Sponges we obtained from Dr. Head, Chicago. He stated they are so numerous there, you may collect a bushel of them in a day. Sections of the Hamilton Sponges formerly were equally numerous, but the localities are limited and many thousands have since been taken away. I pointed out a few slabs from the Niagara Shale at Grimsby, and stated if he could spare time I thought he would find the quarries there highly interesting. The Shales possessed many well preserved Crinoids or Sea Lilies, and

when I was stationed in camp there I succeeded in getting a good specimen of a Trilobite (Homalonotus delphinocephalus). This circumstance perhaps induced the professor to pay the locality a visit, and it was arranged to proceed there on the following morning. We fortunately found Mr. Walker at home when we called on him, and had an opportunity of examining his fine collection of Hexactinellid Sponges, and beautifully prepared sections, together with the large number he recently received from Professor H. Rauf, of Germany.

In the afternoon we visited the corporation quarry, the field where the Chert-flint-flake fossils occur and the higher portion of the same containing sponges, sections. We succeeded in securing several Graptolites, Brachiopods, etc. Prof. Schuchert, on breaking up one of the globular lumps of Chert, laid bare a good section of a sponge, which under the magnifying glass displayed the internal structure, Spicules. I called particular attention to the upper green and Clinton iron bands so well displayed in rear of the upper reservoir, near Judge Robertson's, and pointed out some peculiarities in the Graptolite bed of the lower green band, by which it may be recognized elsewhere.

The general impression among local geologists was apparently that the Clinton series seemed to die out at Grimsby. The upper green band there, rich beyond conception in Dr. Jas. Hall's much debated Fucoid, Arthrophycus Harlani, rested on a red and mottled sandstone. It was represented and figured as a characteristic fossil of the Grey-band Medina Freestone. As the lower beds there are concealed by vegetation in the ravine, their non-existence was erroneously inferred, and while slabs of the concealed measures certainly put in an undoubted appearance in the bed of the brook itself, they were looked upon by myself and others as mere drift material derived from some adjacent locality in the Glacial Age, like the Hudson River rock occasionally noticed there in the bed of the stream.

While residing this past summer at Winona Park, about five miles from Grimsby, I availed myself of the opportunity it afforded me of making a closer investigation of the field geology of the district. Indeed the chief inducement was to ascertain how far the Niagara Chert beds extended, if at all, in that direction (easterly), likewise to correct hurried examinations made there while in command of the

rifle practice companies of the 16th Bedfordshire regiment, detached from headquarters at Hamilton, Ontario. It was generally rather late in the day when the firing ceased, and occasionally I was compelled to prosecute my investigations there on a rainy day which the musketry inspector (with a first-class Hythe certificate) considered would be unwarrantable under the circumstances, viz., to expose soldiers unnecessarily to practical discomfort and utterly disgust them with what our own Canadian volunteers now excel in, rifle practice.

As regards the extension of our local Chert, there I found no indications of its existence. Dr. J. Pettit thinks it does not occur east of Stony Creek, and it is not certain that the beds reach the village itself. The new T. H. and B. railway comes out on the escarpment, I understand, a little beyond, and it may yet, perhaps, afford us a chance of furnishing some reliable data for forming an opinion on this vexed point.

In a former paper on "The Grimsby Excursion," published in the proceedings of 1892-93, you may remember I asserted our local Clinton iron band had quite a different aspect there, and was so changed that I hesitated to put forth a statement that the red and mottled sandstones there were the actual representatives of the Hamilton beds. While I doubted I could be mistaken after such a careful examination, I recognized that others probably might not be so readily satisfied by the bare assertion, unsupported by any additional evidence.

During the past summer, while residing on the lake shore (Winona Park), five miles from Grimsby, I paid several visits to the quarries, formerly worked by Mr. Gibson, and obtained the rock specimens now produced in proof that no mistake was made at the time. Even our colored Lingula band you can see is represented. Although the Brachiopods are in rather a fragmentary condition, the others display the alteration which occurs at a similar horizon. All three specimens are found inside fifty yards.

The object I had in view in calling Prof. Schuchert's particular attention to the two upper Clinton beds at the reservoir, near the Jolley Cut, was to enable him to compare them subsequently with the ones at Grimsby, so that he could form an independent opinion regarding this point. When we reached Grimsby, an old acquaintance informed me I would almost certainly find Prof. Schuchert

with Dr. Johnston Pettit. (I missed the cars by five minutes, and concluded he had gone on by the train. I had to wait for the following one.) But it was only after repeatedly hammering on the rocks around me that I heard the three blows signal repeated behind and the lost Professor joined me, accompanied by an old friend, the Doctor, and after a brief consultation we set to work. In three or four hours we had collected about as many specimens as we could carry.

In the Niagara Shales at Grimsby, there are some thin limestone layers from half an inch to one and a half inches in thickness in which Bryozoons, Brachiopods, Corals, etc., are fairly preserved. The indurated shales also contain many specimens of Stephanocrinus Angulatus and plates of Caryocrinus are very common. We brought away with us some fine slabs of Hall's Fucoid, Arthrophycus Harlani. There are some magnificent specimens of this plant on large masses of white Clinton sandstone. Unfortunately, they are too heavy for removal by the pathway to the quarries. On pointing out a particularly fine weathered example, which Dr. Head said would be well worth $50 if we could convey it to Chicago, the professor remarked laughingly "Well, say $60 if we could only transport it to the Washington Museum." Below one of the first quarries opened and partly concealed by the bush, I have found since our visit others that are little inferior to the one in question, too heavy for removal.

We were sitting on a bank which the Doctor had raised many years ago to prevent the loose slate from sliding down into the ravine and which he removed from above, when he pointed out a particular spot from whence he obtained a fine head of a rare Crinoid (Lyreocrinas) formerly. While we were listening to the relation, Prof. Schuchert commenced to score the shale by his side with the sharp pick end of his hammer. To our surprise he managed to bring up to the surface a remarkably fine specimen similar to the one mentioned by the Doctor, who had a little time before obtained for us another Crinoid I do not recollect to have seen figured or described. However, Mr. Pettit recognized it, as well as the curator. Judging from plates and stems there are many Crinoids in the Niagara Shales at Grimsby. It weathers slowly, being protected by the cliff in rear.

We adjourned in the evening to Dr. Pettit's to see his beautiful collection of Niagara Starfishes, Crinoids, etc. A brittle Star, new

species probably, attracted much attention, as well as the remarkably well preserved Crinoids he obtained from the Grimsby Niagara Shales. The Professor considered many much superior to the ones in the United States National Museum at Washington. Dr. Pettit intends to present the collection to the public school at Grimsby, if they provide him with a proper place for their display. I was glad to learn some young fellows there devoted a considerable portion of their spare time to collecting and to Natural History generally. There is nothing more neglected than the latter in the Provincial public schools, as the Doctor justly remarked.

On an earlier visit to the locality, I carried with me a claw-like implement with a short handle, which I understand is used by gardeners in planting seed. Imperfect as it is, it struck me as well adapted to rake up Crinoids hidden under soft surface shales, and on testing it I found it brought to view a small head of Caryocrinus and a few also of Stephanocrinus angulatus. It only requires the teeth a little longer, closer and about twice the breadth, so as to cover more ground, to make it one of the most useful articles the field geologist possesses for extracting specimens underlying the shales exposed on only the surface presented.

I think Professor Schuchert was not quite disappointed when on the following day, along the foot of the escarpment in an easterly direction, it was doubtful whether we were likely to get any of the large slabs from the lower Clinton band containing complete specimens of the Bathotriphus Fucoid. I think I removed every one years ago that I possibly could. However, I succeeded at last in extracting in situ one of the smaller slabs containing the well known indications near the surface edge. On taking it down, the Professor said, "I will stand by, while you split it." When, striking it a little nearer the centre than usual, it opened out disclosing seven well-preserved, colorless (white) Lingulellæ, and together with the casts on the opposite part that lucky blow of the hammer afforded us no less than fourteen Brachiopods, and the plant also put in an appearance on resplitting the upper half. In the Clinton iron band we found the only specimen known to me retaining both valves of Posidonia Alata (Hall). Single ones even are not common here, and as the Professor appeared unwilling, under the circumstances, to accept the only one I possessed, I was very much pleased with this particular

find. Several other Brachiopods were also secured. We were fortunate enough to get a specimen from the upper blue building bed Niagara limestone of Pholodops Granti (Hall). They had none in the Washington Museum, and the author of "Classification of the Brachiopods" was particularly interested in it, because it appeared to be the sole survivor of a group which was about to disappear altogether—a relic of a former age.

The electric line to Grimsby offers us an opportunity of securing many interesting specimens of Niagara slabs for microscopical examination, independent of the chance afforded us of raking out of the shales a much prized Crinoid, or the rarest of fossils, a Silurian Star-fish. Dr. Pettit informs me he has noticed grooving and polishing on the sides of the hard rocks up the ravine. This would be of considerable importance if it can be clearly established. I hope to have an opportunity next year of accompanying him to the places indicated and bringing to the notice of this section the result of the investigation, Dr. Pettit is too cautious a man to be led into a mistaken view respecting a locality with which he is so thoroughly acquainted.

NOTES.

MAMMOTH BONES DISCOVERY—THE HUNTER STREET TUNNEL.

The recent discovery in the tunnel at Hunter street of some bones, fragments of the skeleton of a mammoth or mastodon, calls for a more permanent record than was afforded by a daily newspaper. Although occurring in Erie clay or till (1½ feet from the top) below the ancient Iroquois beach, it is possible the remains may have been deposited more recently than the clay. If mired in the sand and pebbles, which were subsequently cemented by lime filtration through the mass, the weight of the bones would probably sink them to where they were found. Yet the absence of the tusks, heavy leg bones, etc, is certainly noticeable.

An able paper by Dr. Spencer, F. G. S., "On the Birth of the Niagara River," conclusively establishes that 30,000 years have passed since "the Falls" commenced their recession. [This was also Sir Charles Lyell's rough estimate.] The river cuts through this Erie till, and we may, approximately, form an idea regarding

the time when this was laid down. Elephants were not confined formerly to warm climates. The ones found in Siberia, like our Canadian ones, were furnished with a thick covering of long hair or wool to enable them to resist the cold. Some of our spiritual instructors appear to be ignorant regarding the fact when they allude to elephant remains scattered over the earth by "The Universal Deluge."

While Sir W. Logan and the officers of the Canadian Geological Survey have referred to "*Arthrophycus Harlani*" as occurring "at the top of the red portion (Medina beds) at St. Catharines," and in blue or greenish shales immediately above "*the grey band*" on the Welland canal at Thorold, I can find no record of its presence at Grimsby either in "the Geology of Canada" or "the Paleontology of Ontario, Nicholson." The fucoid occurs also at Hamilton, but in rather poor preservation. Grimsby appears to be the locality where it flourished and attained its chief development before the latest Clinton beds were submerged to prepare the way for the overlying "Niagara limestone deposit." The upper green band in which the plant occurs, plainly indicates a shallow sea, wave marks are frequently noticed. We must not loose sight of this circumstance. We possess to-day advantages unknown to "Field Geologists" of "the Canadian Survey," in former times, when quarries had not been opened up at Grimsby, and merely on a limited scale (very probably) in the immediate vicinity of this city. Do not imagine for a moment that "Silurian organic remains" (unknown to science) may no longer be discovered here. Every year something new turns up, even in the restricted district to which we are confined, by the Acts of a Canadian Legislature, which, through ignorance of of scientific pursuits, renders jesting by U. S. A. contemporaries allowable, unfortunately at our Dominion's expense.

DESCRIPTION OF THE RAILWAY CUTTING.

Read before the Geological Section of the Hamilton Association, Jan. 24th, 1896.

BY MR. A. E. WALKER.

Beginning at the base of the cutting, west we find three feet of blue till, covered by two feet of jointed clay, three feet of sand and concrete covered by ten feet of yellow brick clay; this is covered by four feet of red sand and clay loam, where the red sand rests on the clay shows a damp water line. These strata increase in thickness as we reach Poulette street, where a great undisturbed mound of dark red Madina shales rises from the base of the cutting to about seven or eight feet to the surface, dipping more rapidly on the east, the blue till rests on the ragged edges of this mound on the east. The shale in this mound is dark red with bands of pale green shale intermixed, and about two feet from the base there is a layer of pale green shale about one foot thick. East of this mound, and resting on its edges, we have twelve feet of the blue till, covered by eight feet of yellowish clay, the lower part of this clay that rests on the till seems to be of much the same character, containing the same sub-angular pieces of stone, and appears to be an homogeneous clay, but as it nears the surface, or rather the red sandy loam that rests upon it, it becomes stratified clay, on this rests four feet of red sandy loam, being the surface soil.

This describes the cutting up to Locke street. The ten foot band of blue till continues east to Pearl street, but the yellow brick clay feathers out to Pearl street, and the over-laying red gravel and sand rests now, with the exception of a thin band of yellow clay, on the till. The formation is of the same character until you reach Ray street, at Ray street there were two strong springs of water coming out between the red sand and the blue till, the surface water sinks down and rests on the blue till, as this is impervious to water, whenever you reach this layer of sand rest-

ing on the till the water filtered into the cutting and caused trouble. The ground rises to considerable height between Ray and Queen streets, at this point the cutting is thirty-two feet, the upper twenty-two feet being coarse red gravel and boulders, a few Hudson river, but mostly of granite and Niagara limestones and sand stone, very much mixed, much larger than are found in the concrete, but well rounded. This formation runs to Hess street, but just before reaching Hess street we come across two more springs, and the material laying on the till is a coarse sand, causing the banks to give way, and from this to Caroline street is very sandy, in which are bands of large boulders, mostly of limestone and sandstone,—I found one or two from the Chert, and many kinds of granite and a few Hudson river boulders. As we approach Bay street these layers of boulders become more frequent above the sand that overlays the till, and before Bay street is reached they become concreted by the infusion of lime, and from here to Park street the whole depth had to be blasted. Between Bay and Park is evidently an old lake beach, a continuation of the Burlington Heights, which cross King, Main, Jackson and Hunter streets, crossing the cutting at an oblique angle at the Central School, and thence crossing James at Young and Robinson streets, reaching the mountain at Maclaren's. From Bay street it reaches the level at Charles street. This gives a general idea of the cutting. I will now make some general remarks about the lowest bed, the till.

This blue till is sometimes called Erie clay, but for what reason I do not know, as the glaciers appear to have come from the north-east, and I should judge that this clay was from the grinding down of the Trenton and Utica shales and the Hudson river rocks, as all the portions of stone found in this clay appear to come from these rocks, with here and there portions of granite and other rocks. This boulder till is a uniform homogeneous mass, showing no trace of lamination, but breaking away in perpendicular columns. The fractions of stone found in this till are always sub-angular, and lay in every direction, sometimes on their edges or at an angle at which they had been driven, they are worn quite smooth on their flattened faces, and the glacial scratches are well marked on most of them. I have not found a rounded water-washed pebble, although I have watched over thousands of tons. Resting on this there is two feet

or more of boulder clay of a yellowish brown color which seems to possess all the characteristics of the blue till below. This clay becomes gradually laminated, and is covered by a coarse red sand; on this clay the surface water after filtering down rests, not being able to penetrate these clays. When reaching this sand bed you strike water in more or less quantities. At Ray and at Hess streets, where there is a slight dip in the blue till, the water came as from springs; above this sand is coarse gravel, and filled with boulders of various sizes, the larger ones being Niagara limestone and freestone, and here and there pieces from the chert. These large boulders are not worn into rounded boulders, but are worn down on all their angles. The remaining drift is Laurentian and various other limestones, these are all rounded boulders, and these sandy and gravel beds continue until near Bay street, where we cross the old lake beach, where the water-washed pebbles are all cemented together by the infiltration of the lime held in solution collected from the overlaying clays, which becomes redeposited and recrystallized, forming a solid concrete. All these beds had to be blasted to be removed. You will observe that two-thirds of these pebbles and boulders are from the Hudson river formation, with a few Trenton and Laurentian pebbles.

Now, at the west end of the cutting where it dips to its level at what is called Beasley's Hollow, the ground is cut up into various valleys all running into the Dundas marsh. You will observe that the sand and concrete beds cross all these hills at a water level, showing most distinctly that they have been washed out since the formation of the old lake beach. Just west of the sewer pipe works you will see a conical hill, where two of these streams met, causing the water to swerve around, leaving this small conical hill; they are now cutting it down to obtain the sand. It is a strange sight to view these hills from the west end of Main street where all these various outwashings are well displayed.

I could extend this paper by suppositions as to the probable time of these glacial drifts, and the denuding and laying down of these various beds of drift. But this subject has been so ably described by Professor G. J. Hinde, F. G. S, and others, that it would be presumptuous for me to say more than to note what I have most carefully observed during the progress of the cutting. I have

carefully selected striated specimens from the till, also from the concrete and other beddings which will be of interest to illustrate the diagram.

I might mention that there have been several bones and specimens of wood found laying just above the till. The first discovered was the blade bone probably of a moose. This was found twenty-two feet below the surface in the lower concrete bed at the west end of the cutting, near Garth street; this lower bed of concrete rests on the till, like it does at the Iroquois beach at Bay and Park streets. I also found the lower jaw-bone of some carnivorous animal about eight inches long, between Locke and Pearl streets. It also appeared to be from the sand overlapping the till, but of this I could not be certain as much of the surface falls to the bottom and comes up with the till from the bottom. This has been sent to a professor at Magill University for examination. I also found a branch or root of wood in the same vicinity; it appears to be partly carbonized; it may have been partly burnt before it was drifted there. I think it would be worth while to send all the specimens of wood found to Professor Penholland, of Magill University, as he is a specialist on that subject. There have been some more important finds by Colonel Grant and others, from the cutting near Bay street. He will no doubt describe them when he feels certain of their nature. I had hoped to have had these and some specimens of fossil shells found in the fragments of stone found in the till, but they are mostly small and imperfect, and I do not readily recognize them; however, they are mostly from the Trenton Utica shales and Hudson river. I shall, when they are named, leave them with the specimens now before you.

I have made these few remarks with the object of bringing the subject of these formations before you in order that we may discuss the varying arrangements of these drifts and their relation to the formation of the surrounding country.

OUR CRITICS ANSWERED.

Read before the Hamilton Association, February 26th, 1896.

BY COL. C. C. GRANT.

In *Science*, November 15th, 1895, a copy of which Professor Scheuchart kindly sent me, you will find an interesting account of a collector's notes among the Devonian Canadian deposits. In common with all writers on this subject, Mr. Scheuchart was struck with the abundance, variety and exquisite preservation of our fossil corals. "At Hagersville," he remarks, "a large mass of various compound species are numerous; many hundred tons two years ago were broken up for road making. The original carbonate of lime has been replaced by amorphous Silica. Four miles west of Port Colborne is a rock pile more than fifteen feet high, every piece of which contains corals or Mollusca. At Widder (now named Thedford), where Devonian (Hamilton shales) are well exposed, corals are abundant. What a splendid place for a collector, where you can pick up in a day five thousand specimens of Spirifer Mucronatus.

The local enthusiasm here has been developed by the Rev. Hector Currie, who in the small village of one thousand inhabitants is surrounded by no less than four enthusiastic collectors. Here also, he adds, one is left alone or allowed to collect in the cabinets of the minister, teacher, storekeeper, tailor or section boss, not pained to know you are put down as a curio hunter or lunatic, having to reply to such enquiries as, 'Mister, what do you do with them things? Do you take them home and gild um?'"

The above extract I could not well curtail, and I trust that the proprietors of *Science* will excuse the liberty I have taken in extracting so extensively from its valuable scientific pages.

Canadian geologists must all feel the complimentary notice of Rev. H. Currie's work was richly merited. The provincial boorishness and ignorance, alluded to by Prof. Scheuchart, is not confined to the States. This Province of Ontario could display many amusing

instances of the notions possessed by the rural scholars of this district regarding natural history, etc. A few years ago, I extracted from the Barton shales above the Albion mill a large number of Niagara corals (Streptilasma Cornicula), curved specimens not unlike minute cows' horns. I put them aside on the bank and proceeded higher, intending to collect them on my return. Unfortunately, during my absence some young lads detected them. I found when I came back I was not far astray when I concluded they evidently were up to mischief, and so it proved. On coming up I discovered the group contemplating with much satisfaction the fragments of my entire collection. I restrained my indignation until I heard an explanation of the unusual proceeding. The spokesman of the party gravely informed me, "Well, Mister, them things are devil's horns, and we always smash um." I did doubt the truth of what he said, and merely suspected the boys had acquired their knowledge of the devil's decorations at a rural Sunday school.

We may regret that so little interest in scientific pursuits is shown in this colony. No doubt it will appear here also in its own good time. In the United States recently, a Chicago clergyman offered as an explanation of the so-called Mosaic account of the universal deluge, that it was merely local, confined to that portion of the world then inhabited by mankind, and only domestic animals need have been taken into the ark. The Dr. explains in a chapter subsequently, with regard to the prophet Jonah, the word "whale" is a mistranslation of the original Hebrew term, and he may have been taken in by one of the big sea lizards, an Ichthyosaurus for instance.

Now since the animals alluded to became extinct countless ages before man's appearance, at least as such, it seems probable that science will hesitate to accept the learned gentleman's correction as entirely satisfactory. On the other hand, we have claims put forth by certain clerics regarding "inspiration," etc., which would lead one to imagine that the great Creator confided to sensational preachers the real interpretations of bible astronomy.

In a sermon recently published in the United States, the Rev. Dr. Talmage, in protesting against some of his weak-kneed brethren, who expressed a hope that something would be done to distinguish the human from the divine, and errors in mistranslation in the auth-

orized version of the old testament, theatrically exclaimed, "I believe" (is not that sufficient?) "every page from cover to cover was inspired. I do believe the sun stood still, as recorded; that Lot's wife became a pillar of salt, and a whale swallowed Jonah."

It may be time for our distinguished fellow citizen, the colored professor, who occasionally lectures on astronomy also, to look to his laurels. I am under the impression that his white brother in the States has been appropriating some of his peculiar ideas in "the astronomy of the Bible." It does not seem exactly fair for this Yankee Galileo to borrow what little he knows from scientists regarding the size and distance of the planets, etc., and then turn about and denounce infidel astronomers. We hope our Hamilton professor was excepted. Taking all things into account the whole proceedings savour strongly of what Archdeacon Wilson calls "theological arrogance." Until quite recently the churches of the various Christian denominations did all they could to arrest the progress of science. The Lutheran church persecuted the followers of Galileo in an infinitely more cruel manner than St. Peter's successors. (Of course this well established fact is carefully suppressed in the interests of religion.) I can recall the theological arrogance of half a century back in Great Britain and Ireland, and reflect on the lavish abuse then poured forth on infidel geologists. Now I know that Thor's hammer is wielded to-day by many a reverend gentleman from Oxford or Cambridge (the English universities.) The various churches have ever been slow to accept any views opposed to such as were held in former times by their respective denominations; yet somehow or other they imbibe (unconsciously perhaps) a coloring from their immediate surroundings. Look back to the civil war in the United States, and who fought more gallantly in defence of that foul blot on the Christian religion (slavery), than the Episcopalian, Methodist and Presbyterian clergymen, who exchanged their pulpits for the soldiers' tents, their cossacks for the grey uniform? (That no historical lies in the future can tarnish.) I can recall the time when our bishops, the spiritual peers of the House of Lords, denounced the abolitionists in England as a band of conspirators and fanatics who wanted to overthrow the constitution.

Now when Dr. Talmage in a truly meek and christianlike spirit deals so liberally in damnation of astronomers and geologists

in the sermon, he may be reminded that his impulsive eloquence has led him to forget that he said on another occasion in holding forth on Nature and Christianity: "This is an age of research, nature cannot evade men's enquiries. Hidden laws have come out of their hiding place, the earth and the heavens, since they have been ransacked by geologist, botanist and astronomer appear so different from what they were once that they may be called the new heavens and the new earth. The church rejoices over every discovery as the world rejoices." If Dr. Talmage was moved by the spirit to denounce higher criticism, astronomy, geology, does he not display no little inconsistency now and then in his addresses requiring explanation. It may be he sometimes consults the views of his audience, and his hearers were of a higher class (intellectually) when this latter was delivered than the usual congregation assembled at the Brooklyn tabernacle.

We believe the majority of the clergy on this continent are overworked—that they have too little time to learn anything regarding recent discoveries in the tombs, temples and palaces of Egypt, Assyria, etc. The important records just obtained by Prof. Helprecht, Philadelphia, and Dr. Peters, from the ruins of Niffer, near Babylon, display historical writings dating 4,000 years before Christ. Why are they silent respecting that awful catastrophy the Noachian deluge, said to have taken place on the authority of Archbishop Usher, 2,500 years before our Saviour's appearance on earth? A complete list of Babylonian rulers from 2,600 years B. C. to its fall in 558 B. C. has been obtained. In writing to the States government Minister Terrell expresses his opinion that this American find equals if it does not excel the explorations of Layard at Ninevah or Rasam's excavations. The beautiful obelisk on the Nile which marks the site of the great temple of the sun at Heliopolis, was erected 2,800 years B. C. It is still erect, about 68 feet above the river mud, which conceals a considerable portion of the base, yet this is comparatively modern compared with other relics recently obtained from Egyptian ruins. Old as was the civilization of ancient Egypt, recent research proves clearly that it was indebted to the still older Babylonian empire even for that.

"The world has been satisfied," remarks an English writer, commenting on Sir A. Geikie's inaugural address at Edinburgh, "to take

hitherto what we call the Mosaic account of the creation, etc., as a satisfactory explanation enough; science relentlessly shows we were mistaken in this view. It is highly probable that the first chapters of Genesis were transcripts by Moses of a book ancient even in his time." We all know how bitterly assailed by the various sects of Christianity were modern geologists when they asserted they failed to find any confirmation of the Noachian deluge. "Who believes in it now?" remarks the late Prof. Huxley. The London Times asserts, "where Tyndall stood twenty years ago (at Belfast) our own bishops stand now." Another English writer states, "influence of thought from nature only over a religion which knows not how to defend the divinity of the Word has been immense. The child-like belief which led the Bible's defenders to assert the merest literalism of its records against the hard discoveries and facts of science, we are now (reproachfully) ready to yield altogether." "No such theory as inspiration," adds Archdeacon Wilson, "such as these, namely, the signers of a document who asserted belief that the Bible from cover to cover had divine authority on the testimony of the universal church, is recognized by the church of England or by any branch of the universal church. It is unauthorized as well as unreasoning." Geologists have little time and far less inclination to find themselves involved in theological matters in which they have small concern. Many of the clergy of the different denominations hold liberal and enlightened views on scientific matters. Unfortunately there are others, like "bats from out their narrow spy-holes, looking on the world without." "In former times," remarks the late Prof. Swing, "opinions were made stationary by authority and custom. The people did not possess sufficient education to enable them to perceive new ideas. Liberty removes the restraint and unless the church joins the memoralists in endeavoring to create a better world we cannot promise orthodoxy a bright future. There are three ancient versions of the Scripture,—Hebrew, Samaritan and Greek; in all chronology differs, and Rawlinson expresses a doubt respecting our having the original chronology. He arrived at this conclusion perhaps after he had been compelled to admit by another Orientalist that he had changed the date in translating an Egyptian record in order to meet the accepted belief then prevailing generally regarding the age of the earth." Think for a moment of such an admission, a falsified date

by one of the greatest scholars Great Britain produced in our own time. He yields the lore he learned, the dead language he mastered because he felt the interests of religion may suffer. We feel more inclined to think he supposed the older inscription was a clerical error and he imagined he had a perfect right to correct it. He made a mistake in doing so, that was all.

Now take the statistics of Dr. Talmage's own country, the United States, and what do we find recorded regarding religion there in this falsely styled Anglo-Saxon country? 23 per cent. only of its population are Christian, real and nominal; most part even of these are women. If the reverend gentleman can find such a state of things a subject for congratulation he must be rather easily satisfied with the progress of religion. "Not long since a Catholic prelate regretted, "while we are winning back to the fold so many educated Americans, what of the 12,000,000 Irish immigrants and their descendants? Consider this, far more than half have fallen away from the faith." I believe some little time since Dr. Talmage preached a sermon in defence of the chronology of the Bible. He may not be aware of some recent translations of Egyptian and Assyrian records in the British museum which seem calculated to throw a little light on that very obscure subject, namely, the origin of the Bible stories. Extract No. 1 follows: "Early in the last decade of the nineteenth century it was noised abroad that the Rev. Prof. Sayce, of Oxford, the most eminent Assyriologist and Egyptologist was about to publish a work in which what is known as the higher criticism was to be very vigorously and destructively dealt with in the light afforded by recent research among the monuments of Egypt and Assyria. The book was looked for with the most eager expectation by the supporters of the traditional view of Scripture, but when it appeared the exultation of the traditionalists was speedily changed to dismay. For Prof. Sayce while showing some severity towards sundry minor assumptions and assertions of biblical critics, confirmed all their more important conclusions which properly fell within his province. A few of the statements of this champion of orthodoxy may be noted. He allowed that the week of seven days and the Sabbath rest are of Babylonian origin, indeed the word Sabbath itself is Babylonian. That there are two narratives of creation on the Babylonian tablets wonderfully like the two

Hebrew narratives in Genesis and that the latter were undoubtedly drawn from the former; that the garden of Eden and its mystical tree were known to the inhabitants of Chaldæa in pre-semitic days; that the belief that woman was created out of man, that man by sin fell from a state of innocence, are drawn from very ancient Chaldæan Babylonian texts; that Assyriology confirms the belief that the book of Genesis is a compilation, that portions of it are by no means so old as the time of Moses; that the story of Joseph and Potiphar's wife was drawn in part from the old Egyptian tale of the two brothers.

Andrew D. White in *Popular Science Monthly*. One of the stories of creation deciphered by Mr. Pincher, of the British museum, comes from the library of Assar-Banepol, dates from 650 B. C., but the Akkadian text Mr. P. thinks is a copy of one dating 3,000 B. C. or earlier still.

The tomb of the priests of Ammon recently discovered near Thebes goes back to the 11th dynasty, namely, 2,500 B. C, the date assigned to the flood. But reason appeals in vain to the Rev. Dr. Talmage and his fanatical admirers in Canada or the United States. In one of his sermons he deplores that heretical opinions prevail in all denominations. What a pity that such should be recorded; that the very sanctuary itself could not prevent the entrance of doubt in this faithless age! If the Greek monks who translated the old testament were infallible (incapable of errors), God-inspired men, why repudiate the doctrines of this ancient Eastern Christian church? Does the reverend gentlemen possess an intimate knowledge of either Greek or Hebrew? He puts forth no such claim. Neither does he appear to have heard that it is a theological error to believe the Scripture, in part at least, existed in book form 4,000 years, as he alleges. It dates from the return of the Jews from captivity, and the early portion was taken from oral tradition. Max Muller proves the rijveda of the Hindoes is far older. Was that also miraculously preserved? In delivering one of his masterly lectures the late Prof. Huxley laughingly noticed the abusive epithets hurled at him by his clerical assailants—infidel, coward, liar, etc. "Well," he said, "Agnostic as I am, I never doubted the modern church still possesses the gift of tongues." The famous Orientalist, Kennecott, who died at Oxford A. D. 1783, impeached

the integrity of the Hebrew text of the old testament and fared no less like abuse. Higher criticism to-day informs us that the translators owing to imperfect knowledge of Hebrew numerals egregiously blundered regarding the ages of Scripture Patriarchs. Dr. Talmage knows they did not. "The worst enemies of the Bible," said an eloquent Jewish Rabbi in Hamilton recently, "are the men who hold all is inspired, who are unable to separate the human from the divine in the records of our people." Scurrilous language and misrepresentation of scientists! This indictment appears to come with ill grace from Dr. Talmage and his ministerial brethren. Is it true? Can this reverend gentlemen name one among the many thousands of geologists on this continent or in Europe who indulges in such abusive epithets as he so liberally bestows on all who happen to oppose the illogical conclusions of this high priest of the Brooklyn tabernacle? He seeks notoriety because he calculates it brings in the dollars, and knows well how to avail himself of ignorance and popular prejudice to further his aims.

ADDITIONAL NOTES REGARDING OUR LOCAL GRAPTOLITES.

Read before the Geological Section, Hamilton Association, March 28th, 1896.

BY COL C. C. GRANT.

A few short notes regarding our local Niagara graptolites, perhaps may be acceptable. I am informed that only a dozen or so of the members of the association have ever seen the pamphlet published by Dr. Spencer, F. G. S., in 1884, entitled "Niagara Fossils." It was printed as a bulletin of the museum, State University, Missouri, when the author held the chair of geology in Columbia, Mo., and therefore not likely to attract much attention in Canada, although all the specimens described therein, with one or two exceptions, were Hamilton, Ontario, organic remains.

In some cases the graptolites described are not particularly well illustrated (some 30 new species altogether). A copy of the work was furnished to one of the United States magazines and is now in possession of the curator.

As a monograph of the Niagara fossil hydroza is now in preparation at Washington by Dr. Gurly, F. C. S. A, who is considered the best authority on this continent of these fossils, we may confidently entertain the belief that the numerous specimens obtained since 1884 will receive close attention at his hands both as regards description and illustration. The artists employed by the United States geographical surveys are remarkable for their accuracy as regards details as well as the exquisite general appearance of the drawings, etc.

While I have no intention of interfering in any way with Dr. Gurly's work on the Niagara graptolites, it may be as well to point out the principal localities where they are obtainable, together with such information as may prove useful regarding them—this has already been done by Dr. Spencer, F. C. S.,—but his papers on our

local fossils were published many years ago, some in the States and one or two only at Ottawa or Montreal, so we may conclude they are known to very few indeed here. I have frequently mentioned that a knowledge of the fossiliferous beds is absolutely necessary, and it is merely a waste of time in turning over or examining ones that rarely or never display organic remains. It may not be amiss here to mention a grave mistake of mine when the Jolley Cut Road was first opened. I carefully noted the position (in situ) of the different graptolites in the Niagara chert. The richest layer of rock which contained the largest number of graptolites was noted as occurring exactly six feet below the glaciated chert of the upper bed. It was not unusual to procure seven or eight specimens at the brow of the escarpment (when the road was first opened) in a day. The upper surface of the bed displayed the greater part of these fossils, but we ascertained when the quarrymen worked back a little they were concealed in the interior of the block. This circumstance was revealed by a mere accident. A shot in the corporation quarry shattered the thick flag and a portion of a dictyonema appeared. On dressing it to make the specimens more portable a stroke of the hammer dislodged a part which concealed the complete form (circular in shape) underneath. But despite the knowledge then acquired, for a considerable time subsequently I made insufficient allowance for the dip of the rocks as the quarrymen worked inward from the escarpment. I feel satisfied a good many graptolites were lost before this inexcusable error was detected.

I believe both dictyonema elegans and dictyonema gracilis to be very restricted in their range; both occur in their cherty layers above the main chert bed. I have always found a difficulty in extracting them uninjured and I do not remember their occurrence either above or below.

The free graptolites, namely ones that could hardly have been rooted in the muddy sediment and with no point of attachment apparently, are rare and probably not confined to particular beds. I noticed they occasionally turn up quite unexpectedly. Some new species were obtained here since the publication of Dr. Spencer's papers bearing a general resemblance to cyclograptus, and recalling some of the Cambro Silurian forms already described and figured by Dr. James Hall. Many would look upon them as modified descend-

ants of the more ancient hydroza perhaps. The late Professor E. Billings, either in a letter or a paper I received from him, expressed the opinion that possibly some of the graptolites fixed to the sea bottom were accidentally detached (broken off) and yet lived on, in the same way as the free species. In one instance a deudrograptus stalk he remarked was rounded at the base (it looked as if the fracture had been repaired) and the slight stem trailed behind it. It is not uncommon here to find merely the impression of the base of a callograptus or dictyonema; so we may infer Billings' specimen was not the only species liable to such an accident.

When Dr. Spencer published his papers on the Niagara graptolites we entertained no suspicion that the glaciated chert beds contained more than three or four species, callyptograptus radiatus, acanthograptus pulcher (Spencer), I noticed as occurring in a more or less fragmentary condition in a polished and grooved layer which had been shattered a little way back from the present road. I concluded it proceeded from a single stalk, as one or two others unquestionably did a little lower down the chert. But later a shot was fired and the blast revealed that remarkably well preserved acanthograptus, described and figured as a pulcher. Since that time many other graptolites have been found differing from all below glaciated grooved layers with a few exceptions.

The upper blue building bed (Niagara limestone) contains quite a number of specimens probably new to this continent. They occur confined to certain parts as it were of the beds. A single shot a few years ago exposed a dozen at least. Since then I got only three by splitting the upper flag, the pentamerus bed or base of the Niagara series or the old Clinton limestone from which I obtained about seven new species (three figured by Spencer), formerly presented. I have had no chance of late years of obtaining any from the ravine below the Mountain View hotel. Since the Incline Railway was started no loose blocks have detached from the bed above.

Resting on the Barton Niagara in the till above the Albion Mills I occasionally find fragments of white chert, more flinty in texture than any noticed in the immediate vicinity of the city. I feel disposed to believe that a second and higher layer of chert existed before the great Ice Age. Our Vice-President may recollect I mentioned that the sloping sides of a high cliff near Dundas (hardly ac-

cessible) displayed numerous fragments of chert which essentially differed from that at Hamilton. (Mr. Neill noticed the chert there apparently in situ also). Now if this can be clearly established it may throw additional light on the position of the Tennessee sponge beds. One chert at Hamilton is near the base of the Niagaras. It is said the sponges in the United States occur near the top of the series. I suspect the latter may prove to be ones corresponding with the Dundas chert. The latter displays sponge fragments also.

It may be noticed I have not referred to Clinton graptolites. A dictyonema in the green shales, a small species, may be new—two others have already been described by Hall. The Barton shales as yet have only displayed two others, one already figured by Spencer, which Dr. Gurley, F. C. S. A., thinks identical with a recently named European genus.

The past long winter has been unusually unfavorable for collecting fossils. A great many men were employed in the corporation quarry, but they were changed so frequently, one had not sufficient time to show them how to recognize specimens seen. The frost also penetrated so deeply that it proved difficult for even a practical eye to discover organic remains under the thick coating of ice which enveloped almost every layer in the chert, or blue building beds where the latter were exposed. In fact it was only by splitting the upper grooved and glaciated one of the former, since the workmen ceased quarrying and the snow disappeared partly from the debris left by the last shots on the surface of the cherts, that I succeeded in obtaining a few new graptolites, unknown to me as occurring on this continent in the Niagara Silurians. As we recede from the brow of our local escarpment and approach the overlying Barton shales the graptolites present such a dwarfed appearance that it foreshadows their complete extinction, and specimens new to us may prove merely degenerate descendants of others we have not as yet discovered.

Since the foregoing was written I obtained on the lake shore at Winona a large slab of Cambro Silurian limestone containing numerous specimens of a graptolite bearing to the naked eye a resemblance to graptolithis pristis or diplograptus Hudsonicus (Nicholson). The cell mouths seemed absent and that I considered

may be owing to pressure, etc. On examination subsequently Mr. Walker's magnifying glass failed to display the usual cellules of the diptograpti family, but it revealed however, a peculiar structure we have not remarked in any papers on the graptolites known to either of us. The limestone flag (water-worn and rounded at both extremities) is about 12 inches in length, 9 in breadth and 3 inches in thickness, the fossils occurring on both faces, but mingled with a coral (monticulipora or branching chetætes). Probably twelve generations are represented on splitting the matrix, each overlaying the other regularly. I mention this because I do not think the graptolites were washed up or heaped together in the manner indicated by the Clinton star fishes beyond the reservoir at the bluff or cliff.

NOTES ON THE PIPESTONE DISTRICT, MANITOBA.

Read before the Geological Section, Hamilton Association, April 24th, 1896.

BY J. A. DONAGHY.

Geology—The districts I have been in have not been very favorable for making researches on this subject. In this part of Manitoba we have gravel and sand subsoil. The gravel is composed largely of various kinds of quartz, the remainder being fragments of granitic rocks. They call some limestone out here, but is very flinty in its nature; and although they make lime from it in some parts, the lime is of a very poor quality and will not boil when put in water. The rock contains a few fossil shells somewhat similar to a fossil found at Hamilton but I cannot recollect its name; it is fan shaped, something like a scallop. Some of the pieces of quartz would look very nice if polished, as some are quite transparent. Some have fine white lines through them, something like strata of stone. These pieces are about the size of the end of your finger and the lines not much thicker than paper. They are of a yellowish color, some dark amber, and, if cut across, the lines look very beautiful.

Our surface soil is a scanty soil something like that around Burlington, but not quite so sandy. The surface changes to a clay with clay subsoil a few miles west of here. For sometime I was in what is known as Central Manitoba, at Belmont, about 40 miles south of Brandon. The clay soil there is very often made almost worthless with alkali, and farmers have a hard time to get a well containing water fit for use, on account of the purgative action of the alkali. A poor quality of shale underlies the soil there. It does not seem to contain any fossils, only a fragment of one is found occasionally by looking very closely. The stones on the farms are nearly always big ones—some eight feet in diameter. About six miles north these stones are more plentiful, and protrude above the surface about a foot. There is one peculiar thing about big stones on the prairie that I must mention, that is this, very often these stones are lying in the

centre of a circular hollow about 20 feet across and 3 feet deep. The question often asked out here is, "What made the hollow?" The farmers mostly say it was made by the buffalo rubbing themselves against the stone and and wearing out the earth in doing so, but it is hard to say what the cause is. The stones are granite.

The Eastern coal fields is a place I have not visited, but will tell what I do know about them. They do not sink shafts to mine the coal. The mines are in the valley of the Souris river, and they simply dig in from the banks. The beds slope down in an easterly direction so I am told. The coal is peculiar, and almost worthless. It would be worthless in Ontario, but on the prairie the farmers are glad to get it at $4.25 a ton. If exposed to a dry atmosphere above freezing point for a short time, even for two days, a big block of it will fall to pieces; and when being burned in a stove it must not be shook or raked out, or the whole will instantly crumble and fall through the grate. It is known as slack coal, and is soft. I was going to send you a sample but the heat of the house reduced it almost to a powder. It is mined only during the winter, as a stock of it would be only a loss to its owner,—in summer a fine hot day would make it worthless. It seems to contain a large amount of moisture and when this moisture is driven out of it it shrinks, and if dried under a stove will curl up like wood. It shows the grain of the vegetable matter plainly and pieces of it resemble charcoal made from soft wood, such as pine; and if scraped and a match put to it, it burns like charcoal, and without smoke or smell. I have examined lots of this coal hoping to find traces of ferns but can find only their stalks and stems, although I have found pieces of resin as big as a pea, which if put on a hot stove give out a very pleasant smell somewhat resembling ordinary resin.

Before closing the geological part of the paper, I must say a word about the far-famed Winnipeg mud. No wonder it has a name! Winnipeg is situated on a low piece of country, but well drained by the rivers. The soil is known as Gumbo, and contains alkali. In all parts of the country where they have a clay surface soil they have an occasional piece of Gumbo from a few feet in diameter up to several acres: when it is dry it is too hard to put a plow in, when wet it somewhat resembles glue, but is as slippery as soft soap. The Winnipeg people say they can tell a stranger in the

city on a wet day, as he walks like a person learning to walk on roller skates, expecting his feet to fly out from under him, while at the same time the mud hangs on like glue. They are paving all the streets in different ways, some planked like a sidewalk. If they did not do so the streets would be impassable in wet weather.

Botany—I consider botany and entomology the two best subjects to study out here as there are so many specimens of both subjects to be found on the prairie. The first wild flower to show itself in the spring is the prairie crocus. It sends up a tender stem bearing the bud, growing about four inches high ; then it opens out into a pretty flower, pink inside and mauve outside. The flowers are about an inch and a quarter across and about an inch deep. After the flower has been open a few days it dies and the plant goes on to produce its leaves, and lives through the summer. It sends up a long stem on which the seed are produced. When in seed the stem resembles a window brush on a small scale, each seed having a long feathery hair about an inch long attached to it. When the crocus is in bloom the prairie looks pretty ; after having our long winter, the prairie is covered with bloom, and without any exaggeration I can say there at least three blossoms for every square foot of prairie, so you can imagine what it must look like. But it lasts only for about ten days. Towards sunset, when the plant is in seed, a fine sight is seen by looking towards the setting sun,—the millions of fuzzy bunches of seeds give the ground a misty appearance. I cannot in this paper give the dates the different plants blossom on, but will make special notes next summer. The buffalo apple or prairie plum is a flat growing plant. It lies on the ground and sends out its branches in all directions so that the plant is circular ; I understand it belongs to the pea family. Its flower is a red pink, and appear in bunches, it resembles the pea flower only smaller. Its fruit is about an inch long, or perhaps a little over, its width is about half its length. To eat them raw before the skin gets tough the taste is exactly like eating pea pods. Some say that if picked young they make good pickles. The fruit is merely a thick pod divided into two equal apartments containing seeds, and become a mere dry shell in the fall. The wild orange lily is a very nice plant. It grows up straight for about twelve inches and then blossoms. The leaves are few, being attached to the main stem

with scarcely any petiole. They are about one quarter of an inch wide and two and a quarter long; dark spots inside something like the tiger lily, in fact it resembles it more than the orange lily. Usually only one flower is found on a plant, but sometimes two or even three are found, the flowers being on the top of the stalk.

The wild rose bushes are a weed out here. They grow in the fields and make such a mass of tough stringy roots that it is hard work to plow where they are. They grow only ten or twelve inches high, but for a good supply of roses and a fine perfume I do not think they can be excelled. While they are in bloom the air is fairly saturated with perfume, and although a person may be in a spot where they can see no roses they will be able to smell the perfume of a bunch of them probably a hundred yards away. We have another plant that rivals it for perfume, but not in looks. It is a low plant not over four inches high, the leaves growing close to its stalk, and its yellowish green flowers looking as though they were part of the leaves. It blossoms before the rose, and no other wild flower is visible at the time. It is a puzzle to strangers where the perfume comes from,—they never think of this little plant, because it does not appear to have any blossoms, and looks as though it had an unpleasant smell instead of a very fragrant one.

There are three kinds of violets,—two violet ones and a yellow one. The difference in the two violet ones is in the leaves: one has ordinary violet leaves, while the other has a leaf very much cut. We have many other pretty flowers but strange to say the prettiest are very bad smelling, while the humblest looking ones are the ones that have a delicate perfume. For a wild fruit we have a native wild black currant. It is very productive, the fruit being large but slightly bitter until cultivated for two or three years. The saskatoon is very similar to the eastern huckleberry, but under very favorable circumstances they grow ten feet high; the majority of bushes, however, are only about four feet high. We also have the common wild raspberry, and the strawberry. Our strawberry seems different from the Ontario berry; the Ontario berry is long and pointed while ours is a short plump berry of good size. Another fruit called the cranberry grows on trees. It is a red fruit about half an inch long and a quarter of an inch in diameter and has a flat seed about three-

sixteenths of an inch in diameter. The common wild gooseberry is also on the list, and wild plums too are found in some places, but are not so common as other fruit. As for grasses, I will mention only a couple of varieties. One is the common sweet grass that Indians make fancy articles out of. It is one of the worst pests a farmer can have, it will form a dense mass of roots and choke out crops. Its roots are like common white string ; a piece of it is apt to get carried some distance with the harrows and thus starts a fresh spot. It is a very hard grass to get rid of. The spear grass is another very bad pest. Its seeds are like oats, except that the hull finishes up in a long stiff bristle about three inches long ; this bristle has *teeth* all pointing to its outer end. When a person is walking where this grass is these seeds drop and the big end, which has very sharp point at its base, enters the clothes and the long bristles serve to force the seed ahead. It will weave itself in and out of the cloth in a peculiar manner, every movement serving to send it ahead. To get it out it has to be forced through frontwards, like a barbed hook. Sheep have been butchered and after their hides were taken off the carcasses found to be a mass of scars and the skin full of the spears.

Zoology—The first animal to be noticed is the troublesome gopher. It is similar to the prairie dog. It lives in the ground and depends on the farmer for its living. They are about as big as a squirrel, but have a small tail like the chipmunk, and are a yellowish gray color. Their claws are made for digging. These pests multiply at a fearful rate and destroy lots of grain. The farmers have to fight them with poison, dogs, guns and any means possible. They store away immense quantities of grain for winter use.

The badger is another animal that lives in the earth. In some parts the farmers protect them as they are said to live amost entirely on the gophers ; others, myself among them, object to them on account of the holes they dig while going down after a gopher. They dig a regular post hole and many a good horse has been hurt by getting a leg in one of these holes on a dark night. A favorite spot for them to dig is right in the middle of the trail, the most dangerous spot they could dig on account of the traffic across the country. We also have skunks. I have never chased one to its den so I cannot say where they live, but judging from their claws I should think they lived underground.

Weasels are animals that have their friends and their enemies. They kill gophers without having to dig a big hole to get after them, but also kill chickens.

Prairie wolves or coyotes are getting scarce around here at least, although one has passed here several times lately. They are great cowards, and will run from a human being every time. I have chased a whole pack from a dead horse, so that I could lay out poisoned bait. I had not the least thing with me to defend myself if they turned on me, but no one need be afraid of coyotes; with timber wolves it is a different story. These are up north of the main line of the C. P. R. in the timber country. Foxes are also on the list; they seem to be seldom out in daylight; at night they roam around making a hideous noise, three or four short barks then a piercing scream. It would make a person feel queer if he were out alone and heard one quite close. The buffalo of course is extinct. Their bones are scattered over the prairie with the teeth marks of wolves still showing plainly.

Ornithology—As for wild fowl, I will not go into detail over the common varieties. There are prairie chickens, said to resemble old country grouse, patridges, common gray geese, millions of them, also millions of wavies or white geese, the latter not protected by law. I have seen a flock of wavies covering several acres, also a flock of both varieties together covering several acres. A rifle ball often kills four or five before it loses its force. The sandhill crayone is a dark brown bird; some think it the finest game in the fowl line. They make a peculiar croaking noise that can be heard a long way off, although they do not croak very loud. They fly very high; I do not think I am exaggerating when I say they are often half a mile above the earth. When seen on the prairie they appear a fair size, but they fly so high that a person has to watch very close to see them at all, they appear as mere specks. During flight they circle round, stopping every little while to make a sweep, except when flying low. On rare occasions I have seen white ones with the others. We have numerous small birds, wrens, gray birds, wood peckers, blue jays (a winter bird), blackbirds and many others. There is one whistler I have never had a close look at yet. It will sit on a tree and whistle a low soft note, repeating it several times; then it will try a higher note the same way, and so on till it seems

satisfied that its whistle is in tune. It seems to possess five or six notes and cannot whistle any others. It sounds more like a flute than a bird. When it is satisfied that its voice is all right it starts to play a soft sweet tune, not very fast. Its lowest note is rather low, and its highest rather high. I have never heard a name for this bird.

The cow birds are the tamest of the lot. They like to roost on the backs of cattle and on their horns. The female is a brown slate color; the male a fine glossy peacock blue, and has a very sweet musical voice, but the only sound it makes is a very sweet "clink-clink." It half expands its glossy wings and ruffles its feathers up. They will follow at the very heels of a person plowing; I have had them within two feet of me. They pick insects out of the freshly-plowed earth; we have no earth worms out here.

Our best singer is a dark bird about the size of the canary. It is a dark brown, a dirty looking color. When it is going to sing it rises almost straight up for about twenty-five feet, then starts its song and soars down to the earth, singing as it goes, and lights about 100 feet from the spot it rose from, finishing its song a few seconds after lighting. I think it can excel anything I have heard.

The last bird I shall mention is one of the most interesting. During spring, early in the morning from daylight till seven o'clock, their sound is heard. It always seems to come from a point near the horizon, and as there are scores of them it makes a continual noise.

Their noise is a "boo - woo - oo." The "boo" is a low soft sound, the "woo" is a note or two higher, and the "oo" is higher still. As each bird keeps its song up, it sounds as if the prairie was coming back to life. It is a strange thing that the sound always seems to come from a point several miles off, but as each bird has different notes it is a pleasant sound, it is so soft and travels so far.

ATMOSPHERIC PHENOMENA.

This is a very interesting subject, as our atmosphere is, in my estimation, the most wonderful part of Manitoba.

As you know, our atmosphere is a very dry one, especially during the winter, when the thermometers may go down to 60° below zero and the cold not be felt any more than it is in Ontario at 15°

below. In the summer we have the other extreme, except that our nights are very cool.

One of the first things I will mention will be the distance sound travels. It is generally in the evening; a peculiar stillness comes over the prairie, a stillness that cannot be described. When the air is in that condition we can distinctly hear every word spoken at over a mile; houses are far apart here, generally a mile apart, and I have often heard my neighbor talking in the evenings. Sometimes it is the same in the morning, and stays so till about noon. I remember one day especially, it was a very foggy morning,—a rare thing out here. I was plowing, and had got to the other end of my field, when I heard a voice come out of the fog. It was a man speaking to his team. He appeared to be only a few feet from me, and I almost expected to see him any moment. I started back to the south end again, that is half a mile, but seemed to get no nearer the man and team. About noon however the fog got thinner, and I saw it was a neighbor of mine plowing south of me, it was a little over a mile and a half from the north end of my place to him, and yet I heard him as distinctly as if he had been beside me.

On another occasion, it was a moon-light night in the fall during harvest. A neighbor two miles away was cutting his wheat very late at night, near ten o'clock, as the night was threatening frost. Every sound of the binder was distinctly heard, and every word he said when he turned the corner. He was over two miles away, (when he was at the far end of his field) probably two-and-a-quarter miles, yet we could hear the machine tie every sheaf and throw it out.

It would not do to be running down your neighbors on such days as these. Mirages are common. The only wood visible from here is some on the Indian reserve, but many days we see miles of timber around us. Some of it must be a long distance off. Turtle mountain, ninety miles away, is often brought very close. These mirages are seen in winter; in summer we see a different class,—lakes and rivers that do not exist at all. I started home one day from town, walking along the railroad, about a mile away appeared a grand lake with rippling waves, and the houses on the opposite shore reflected in it as natural as life. The track ran into the water and disappeared, but came out on the other side. The lake ex-

tended over a mile south of the track and ran for miles north-west, where it dwindled into a narrow crooked river with marshy shore. My house was on an island in the river, and was reflected very naturally. I would have liked to have photographed it; the gentle breeze caused it to ripple in the hot sunshine, and all it needed to complete the picture was a vessel or two, but as I approached the lake it faded from view, and I waded through it on dry land.

Here is the cause of it, a layer of over-heated or highly heated air lay along the prairie, and all the low land being lower than myself, I was able to look across the surface of this heated air, and it acted as a mirror reflecting the sky or anything else near its "shore"; but as soon as I was low enough so that my eyes were below the level of this stratum, it no longer acted as a mirror.

There is a marsh just north of town that was dry all last summer, but one night after sunset, while coming home, it appeared flooded again, cattle were standing up to their knees in water. It was very natural looking but only a layer of thick mist, probably only three feet thick in the middle of the marsh. Another evening just about dark a mist came creeping over the prairie from the north-west. It kept in the low spots, and came very slowly. My house is on a hill, and by the time it was dark it appeared surrounded with water.

Another interesting thing is whirlwinds. I was reading the other day that in the northern hemisphere whirlwinds revolve the opposite way to the hands of a watch if held face up, while in the southern hemisphere they revolve with the hands of a watch. From my observations I would say that is wrong, as I have taken particular notice of them to see if they all whirl the same way, and have noted that they all whirled to the right, and noted that if a screw were turned in the same direction it would go *down*, while the dust went *up*. Whirlwinds are all sizes, from four feet in diameter by ten feet high to fifteen feet in diameter and over a hundred feet high. They can be heard coming across the prairie by the sharp swishing sound in the grass, and can be traced by watching the grass bowing down in it. When it travels over plowed land a column of black dust rises up like a huge chimney travelling over the prairie. A small tornado passed near me last summer. I will enclose a drawing of it. It twisted a stable or two out of place and picked up a haystack.

The wind does some peculiar things. I have seen it blow at a fearful speed from the southeast for three days, and then suddenly drop at night, and five minutes later be tearing down from the very opposite direction with the same terrific speed.

Storms will come across the prairie battling with a heavy wind but stopping for nothing. We were having a big southeast wind one day, and a big storm came down from the northwest. The front clouds on the storm were whirled over and over, and, when over my place, a huge mass of clouds was sucked down till it nearly touched the prairie, and then whirled aloft in an instant. It was a peculiarly wild scene.

During the winter the principal sights are sundogs and northern lights. The sundogs are grand when there is lots of frost flying in the air. A ray of light extends from the sun to the right and left. At the point where it crosses the inner circle it forms a ball of white light bigger than the sun and from these the rays extend completely around the horizon. At a point directly opposite the sun a dull misty ball is formed, and the same at a point on each side half way between the sun and the light opposite it. The uppermost half circle is the most brilliant and the centre of it is always directly over head. This circle lies horizontal, although in a drawing it is impossible to make it look so.

Sun dogs are our only reliable weather signs. They always mean colder weather; it does not need a certain temperature to cause them; it may be 20° below zero for a week and sundogs may not appear, but if they do appear it is sure to get colder, even if it is above zero. One fine day in May I was rolling a field. It had been a hot day, but towards sunset a pair of sun dogs came. I thought they were decidedly out of place at that time of the year, but next day was cold—too cold for comfort.

This country has a bad name for blizzards, but it is not so bad as people think. The reason is that the word "snow-storm" is not used; a real blustery snow-storm is called a blizzard.

We have some very bad thunder storms out here, the worst I have ever seen. I often wonder how the few houses manage to escape the lightning; but very few ever get struck, although my nearest neighbor has had his struck twice.

The northern lights are very interesting. They are very bright, often lighting the prairie as good as the full moon. I have seen two-thirds of the sky covered with the fiery-green darting rays. I did not think they would be visible to the south of us, but sometimes they appear a long way south of us. The whole sky seems to be a waving mass of green fire ; they are at their best at 9.30 p. m.

One night I saw something a little out of the usual line, a luminous spot appeared directly overhead, and faint rays ran out in all directions from it. It gradually lightened till the whole thing was blazing very brightly with a great variety of color, red being the most prominent. The centre was a fiery cloud ; the rays seemed to point down to the earth on all sides, forming a fiery canopy. It lasted only a minute or two and then faded away.

I have heard of a horse being killed by a flash of lightning from a clear sky, but did not see how it could be possible. One Sunday night, however, after we had had a storm the sky cleared up entirely, and at sunset only a huge mountain of cloud was visible. It was miles away in the south-east. All at once a loud report directly over our heads made us look up just in time to see a white streak darting across the dark blue sky. It went straight north, but did not strike at the earth. There was no cloud within fifty miles of us, except the huge bank in the south-east, and it was at least 20 miles away. That is the only time I have ever seen such a thing occur. I have seen a few hail storms. One gave us hail stones as big as your fist. They were slightly flattened, and one side hollow so they resembled birds' nests. They fell at night, so no damage was done to people or stock. I believe one of them would have killed a man.

REPORT OF THE PHOTOGRAPHIC SECTION.

Read at the Annual Meeting, May 7th, 1896.

BY J. M. EASTWOOD.

Interest in amateur photography in Hamilton has greatly increased during the past year. The study of the photographic art has been encouraged, and the educational advantages offered by the Hamilton Association have been brought to the favorable notice of the public. There are now forty-one names on our roll. Nine have been added to the membership during the past year, and two have withdrawn. The Section mourns the loss of one of its active members, Mr. Walter Chapman, whose death by drowning while bathing in Hamilton Bay is a sad loss to the Hamilton Association of which he was a valued member.

No club outings were held during the year. Demonstrations on lantern slide making were given by Messrs. Moodie and Baker. A professional treatment of Aristo platino paper by Mr. Weed, at the studio of Mr. C. S. Cochran, was of much interest to the large number of members who were present.

Practical addresses have been given by the Honorary Adviser of the Club, Mr. A. M. Cunningham, and also by Mr. S. John Ireland, principal of the Hamilton Art School, whose advice on "Composition of a picture" was instructive and profitable to all the members of the Camera Section.

At the Club Competition, held in June '95, very creditable work was exhibited by the members, and prizes of dry plates, supplied by the makers by favor of Messrs. Cochran and Cunningham, were awarded for the best prints. The members and their friends have had the pleasure of seeing the prize set of slides of the "American Photographic Journal," the American interchange set of the Chicago, Buffalo and Bethlehem, Pa., Clubs, by special favor of Mr. F. C. Beach, New York, and the Rau professional set of foreign views

loaned by Mr. G. W. Gilson, of Toronto, at the series of open meetings held during the season.

The President, Mr. J. R. Moodie, deserves the thanks of the Section for his kindness in giving his valuable time and attention to further the interests of the Camera Section, also Mr. Julius Grossman and his efficient orchestra for their valuable assistance at the Club's recent "At Home."

It is important that the members work together to secure a set of representative slides which will be accepted by the Board of Examiners of the American Lantern Slide Interchange for this year.

J. R. MOODIE,
President.

J. M. EASTWOOD,
Secretary.

CURATOR'S REPORT.

Read at the Annual Meeting, May 7th, 1896.

BY ALEX. GAVILLER.

Two Zulu Assagai from the battlefield at Ibeka, during the Gaika Gallaka war in South Africa of 1877-8-9. Donor, Mr. Geo. W. Richardson.

A number of curiosities, donated by Mrs. S. J. Myles, sent by her from California at two different times. A number of shells, corals, dried ferns, beans, a small Japan tea service, one spoon particularly finely made from two shells, fourteen large Sea Gull eggs, a very perfect specimen of Tarantula spider and Mason spider nest, a Ceylon fan, and other small articles.

A number of animal bones and pieces of timber dug out of the tunnel cutting constructed along Hunter street in this city for the T. H. and B. railroad, during December last. Some of these remains were found at a depth of thirty feet, some at forty feet, below the surface, in the conglomerate section. A very interesting eight feet long colored draft, shewing the different strata of this deep cutting, has been made by Mr. A. E. Walker, of this city, and presented by him to the Museum.

A very large cup sponge, and some smaller specimens, donated by Mr. A. Rutherford.

A specimen of branch coral. Donor, Mr. D. G. Leester.

A number of shells; one particularly, a fine "Echinus." Mrs. Beasley, Hamilton.

A ninety year old Flax Hackle, belonged to the grandmother of the donor, Mr. J. Terryberry.

A brass Icon (dated 1567) of the Greek Church, in good preservation, and doubtless held in great veneration by the original owner.

The Museum has been kept open every Saturday afternoon during the year, and has been largely visited during that time; and many travellers passing through the city have also dropped in for a short time.

HAMILTON ASSOCIATION.

Statement of Receipts and Disbursements for the year ending May 7th, 1896.

RECEIPTS.

Cash balance from 1895	$ 206 10
Government Grant	400 00
Subscriptions	134 00
	$740 10

DISBURSEMENTS.

Rent Museum and Dark Room	$ 174 00
Caretaker	42 65
Printing Annual Report	106 00
Insurance	20 00
Grant to Photographic Section	39 50
Gas	17 50
Stationery, Postage, etc	20 00
Sundry accounts	89 90
Balance on hand	230 55
	$ 740 10

J. M. BURNS, *Treasurer.*

We have examined the vouchers and found them correct.

H. P. BONNEY, F. HANSEL, } *Auditors.*

REPORT OF THE CORRESPONDING SECRETARY.

Submitted at the Annual Meeting, May 7th, 1896.

BY REV. J. H. LONG, M. A., LL. B.

To the Officers and Members of the Hamilton Association:

Your Corresponding Secretary for the session 1895-6 begs leave to report as follows:

I. He has, during the session, carried on the ordinary correspondence of the Association.

II. He has sent "The Journal and Proceedings" to the members of the Association, and to the following bodies:

I.—AMERICA.

(1) CANADA.

Astronomical and Physical Society	Toronto.
Canadian Institute	"
Natural History Society of Toronto	"
Department of Agriculture	"
Library of the University	"
Geological Survey of Canada	Ottawa.
Ottawa Field Naturalists' Club	"
Ottawa Literary and Scientic Society	"
Royal Society of Canada	"
Department of Agriculture	"
Entomological Society	London.
Kentville Naturalists' Club	Kentville, N. S.
Murchison Scientific Society	Belleville.
Natural History Society	Montreal.
Library of McGill University	"
Nova Scotia Institute of Natural Science	Halifax.
Literary and Historical Society of Quebec	Quebec.
L'Institut Canadien de Quebec	"

Natural History Society of New Brunswick ..... St. John.
Manitoba Historical and Scientific Society..... Winnipeg.
Guelph Scientific Association ..... Guelph.
Queen's University ..... Kingston.

(2) UNITED STATES.

Kansas Academy of Science..... Topeka, Kan.
Kansas University Quarterly..... Lawrence, Kan.
Psyche ..... Cambridge, Mass.
American Academy of Arts and Sciences ..... Boston, Mass.
Library of Oberlin College ..... Oberlin, Ohio.
American Association for Advancement of Science. Salem, Mass.
National Academy of Sciences..... Cambridge, Mass.
Museum of Comparative Zoology ..... " "
American Dialect Society..... " "
United States Department of Agriculture ..... Washington, D.C.
Biological Society of Washington..... " "
Philosophical Society of Washington..... " "
Smithsonian Institution..... " "
United States Geological Survey ..... " "
American Society of Microscopists ..... Buffalo, N. Y.
Buffalo Society of Natural Sciences..... " "
California Academy of Sciences..... San Francisco, Cal.
California State Geological Society ..... " "
Santa Barbara Society of Natural History..... " "
University of California..... Berkley, Cal.
Minnesota Academy of Natural Sciences..... Minneapolis, Minn.
Academy of Natural Sciences..... Philadelphia, Pa.
Academy of Sciences..... St. Louis, Mo.
Missouri Botanical Gardens ..... " "
American Chemical Society ..... New York City.
New York Microscopical Society..... " "
The Linnean Society..... " "
American Astronomical Society..... " "
American Geographical Society ..... " "
New York Academy of Sciences ..... " "
Torrey Botanical Club ..... " "
Central Park Menagerie ..... " "

Cornell Natural History Society.....Ithaca, N. Y.
Johns Hopkins University .....Baltimore, Md.
Kansas City Scientist.....Kansas City, Mo.
Wisconsin Academy of Science, Art and Letters..Madison, Wis.
Society of Alaskan Natural History and Ethnology.Sitka, Alaska.
University of Penn.....Philadelphia, Pa.
Franklin Institute ..... " "
War Department .....Washington.
Field Columbian Museum.....Chicago.
Academy of Sciences.....Chicago.
Agricultural College.....Lansing, Mich.
Colorado Scientific Society ....Denver, Col.
Museum of Natural History .....Albany, N. Y.
Rochester Academy of Sciences .....Rochester, N. Y.

(3) WEST INDIES.

Institute of Jamaica .....Kingston, Jamaica.

(4) SOUTH AMERICA.

The Royal Agricultural and Commercial Society
of British Guiana.....Georgetown.

II.—EUROPE.

(1) GREAT BRITAIN AND IRELAND.

England.

Bristol Naturalist's Club ....Bristol.
Literary and Philosophical Society of Leeds.....Leeds.
Chonchological Society ..... "
Royal Society.....London.
Royal Colonial Institute ..... "
Society of Science, Literature and Art..... "
Geological Society ..... "
Manchester Geological Society.....Manchester.
Mining Association and Institute of Cornwall....Camborne.
Cardiff Photographic Society.....Cardiff.

Scotland.

Glasgow Geographical Society .....Glasgow.
Philosophical Society..... "

Ireland.

Royal Irish Academy ..... Dublin.
Royal Geological Society of Ireland ..... "
Naturalist's Field Club ..... Belfast.

(2) AUSTRIA-HUGARY.

Anthropologische Gesellschaft ..... Vienna.
K. K. Geologische Reichsanstalt ..... "
Trentschin Scientific Society ..... Trentchin.

(3) BELGIUM.

Société Géologique de Belgique ..... Liége.

(4) DENMARK.

Société Royal des Antiquaires du Nord ..... Copenhagen.

(5) FRANCE.

Académie Nationale des Sciences, Belles-Lettres et Arts ..... Bordeaux.
Académie Nationale des Sciences, Arts et Belles-Lettres ..... Caen.
Académie Nationale des Sciences, Arts et Belles-Lettres ..... Dijon.
Société Géologique du Nord ..... Lille.
Société Géologique de France ..... Paris.

(6) GERMANY.

Naturwissenschaftlicher Verein ..... Bremen.
Naturwissenschaftlicher Verein ..... Carlsruhe.

(7) RUSSIA.

Comité Géologique ..... St. Petersburg.
Rüssisch-Kaiserliche Mineralogische Gesellschaft "

III—ASIA.

(1) INDIA.

Asiatic Societies of Bombay and Ceylon.
Asiatic Society of Bengal ..... Calcutta.
Geological Survey of India ..... "

(2) STRAITS SETTLEMENT.

The Straits Branch of the Royal Asiatic Society..Singapore.

(3) JAPAN.

Asiatic Society of Japan .....Tokyo.

IV.—AFRICA.

(1) CAPE COLONY.

South African Philosophical Society .....Cape Town.

V.—AUSTRALIA.

(1) AUSTRALIA.

The Australian Museum .....Sydney.
Royal Society of New South Wales ..... "
Linnean Society of New South Wales ..... "
Australian Natural History Museum .....Melbourne.
Public Library of Victoria ..... "
Royal Society of Queensland .....Brisbane.

(2) NEW ZEALAND.

New Zealand Institute .....Wellington.

(3) TASMANIA.

Royal Society of Tasmania .....Hobartown.

It will be noticed that several new names occur on this list of scientific bodies. It is hardly necessary to say that our Association receives copies of Proceedings, Journals, and in some instances valuable books, from these various societies and governmental departments.

All of which is respectfully submitted.

J. H. LONG,
Cor. Sec'y H. A.