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ABSTRACT OF MINUTES

OF THE PROCEEDINGS OF THE

Hamilton Association

DURING THE

SESSION OF 1899-1900.

THURSDAY, NOVEMBER 9th, 1899.

OPENING MEETING.

The President, Thos. W. Reynolds, M. D., was in the chair.

After thanking the Association for the honor of being re-elected President of the Association, the President delivered his inaugural address, in which was set forth the historical parallelism in the development of national Literature with the development of Architecture and Art.

At the conclusion of the President's address, the meeting was given over to an informal display of the work of the various sections.

A choice musical programme was rendered through the kindness of J. E. P. Aldous, B. A.

Attendance for the evening about three hundred.

THURSDAY, DECEMBER 7th, 1899.

The President, Thos. W. Reynolds, M. D., in the chair.

The minutes of the previous meeting were read and confirmed.

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

It was resolved that the congratulations of this Association be extended to the Canadian Institute on the occasion of their centenial celebration.

A vote of condolence was passed to the family of the late Sir William Dawson. In moving this resolution, Col. C. C. Grant spoke feelingly of the loss sustained by science through Sir William Dawson's death, and paid a deserved eulogy to his high moral character and scholarship.

Dr. A. W. Stratton, President of Lahore University, India, a former officer of the Association, was elected an honorary member.

J. A Paterson, Esq, Ex-President of the Toronto Astronomical Society then read a very instructive paper on the Darwinian Theory of the Tides, giving a scientific exposition of the subject and explaining by means of blackboard illustrations the effects of the lunar and solar attractions. The tidal phenomena, he said, involves the origin and history of not only our own solar system, but that on which other planets depend. He explained by mathematical illustrations how the lunar attraction was stronger than the solar, and that the tide rising effect varies as the cube of the distance from the moon to the earth. The Darwinian theory predicts that the sun and moon will eventually move as a solid bar, and that there will be no lunar tides. The solar tide will gradually retard the earth's rotation and the moon will be attracted to the earth and ultimately fall into.

The subject was warmly discussed by the members and a hearty vote of thanks was tendered the speaker of the evening.

THURSDAY, FEBRUARY 15th, 1900.

President, Thos. W. Reynolds, M. D., was in the chair.

Minutes of the last regular meeting were read and confirmed.

An application for membership was read from Geo. L. Johnston, B. A.

The President introduced to the Association John W. Cresar, Esq., Q. C., who read an able paper entitled "Money as a Factor in Trade and Commerce."

Mr. Crerar began by stating that he felt some hesitation in selecting this particular subject, because it constituted a branch of political economy, and in his experience political economy in Canada was generally regarded as a branch of party politics, and on that account was practically tabooed from popular discussion. It always appeared anamolous to him that while astronomy, chemistry, geology or even theology—the most fruitful of all acrimonious argument—were considered scientific subjects, political economy, taught in all our colleges and universities as a science, was deemed objectionable in the conversation of social intellectual life, because it involved party politics. He hoped his hearers were not such slaves to any political party as to be incapable of considering this branch of political economy, as a branch of a science based upon immutable principles.

The lecturer then entered into his subject, and defined money as that portion of the world's accummulated wealth abstracted from productive capital, and set apart as an agent to facilitate barter. Money was an expensive machine kindred to weights and measures in utility, although infinitely more expensive. The metallic money of the world amounted to something like $8 per head of the population of the civilized human race, and that enormous sum was abstracted from the world's capital for the mechanical purpose of making the residue more productive. He then traced the history of money. Its origin could only be conjectured. its necessity arose when the introduction of the division of labor had stimulated production into a vast variety of products. Barter became an impossibility. Without some common measure of value by reference to which the exchange value of all products was expressed, the relative value of one product with another became impossible.

An immense number of individual products had been chosen for this common standard. Skins, cattle, corn, oil, shells and even wrought straw, had been selected as a common standard. A standard of value need not necessarily be any material object. A mere name, as a mental calculus, was sufficient. But the common standard of value was not enough to render barter practicable. A medium of exchange was found necessary. As ultimately the precious metals were selected as the common standard these were found from their

inherent qualities of durability and fixity of inherent value best suited for a medium. Gold or silver—sometimes one, sometimes the other, never both at the same time in the same locality—were first chosen as a standard of value and as a medium of exchange, and when coined into pieces with the state's mark affixed to warrant the weight and degree of fineness, this medium was called money.

Mr. Crerar then referred to the distinction between international and national, or domestic money. The former was used in commerce; the latter in trade. Thirty years ago it required $17 to effect the exchange in money—to effect the exchange of $100 worth of produce between nation and nation. To-day probably not more than $2 was used for that purpose. The ocean cables, fast sailing steam vessels, extended telegraphic and telephonic systems, had effected an enormous saving in the waste of capital consisting of the precious metals devoted to the purpose of facilitating barter between nation and nation. In trade, statistics showed precisely what money was used to facilitate domestic barter. France had the largest per capita volume of domestic money in the world, and Canada, excepting China and India, whose dense populations were exceptional, had the smallest. Nevertheless, the Canadian currency, with its domestic money constantly in use, was ample and was as safe as the currency of England. If the currency system were adopted by all of the trading and industrial nations, thousands of millions of dollars of the world's surplus wealth now playing the part of a machine to facilitate barter would be released and restored to productive purposes.

The popular notion is that the circulation of money stimulates trade. Money makes the mare go. This is a fallacy, Mr. Crerar contended. Trade make money circulate. The circulation of money is an effect, not a cause. A united effort by the government and the banks to increase the amount of money in circulation would prove abortive. The greatest expansion in the volume of Canadian currency is in the month of November; its lowest contraction is in May. Neither the banks nor parliament could turn that around and reverse the May and November conditions. Similarly, there is no power to increase the Canadian currency from $9.50 a head of our population to $15 a head as in England As well expect the corner

grocer to add to his sales by increasing his weights and measures. As trade expands the currency expands, and conversely.

The lecturer then referred to a great many fallacies regarding the economic laws governing trade and commerce, owing to the popular errors regarding the functions of money. For example it was popularly supposed that the most profitable commerce was that which produced a large surplus of exports over imports. Mulhall points out how imports must necessarily exceed exports in value, because the former cover the costs of freight and insurance upon the latter, which until very recently amounted to about 6 per cent. The popular delusion is that when exports exceed imports the difference is brought back in money, as if there were some special advantage in that brand of labor product which consisted of metallic pieces of a given weight, shape and diameter. If money was a mere machine to facilitate barter, like weights and measures, the tape line or the yard stick, as undoubtedly it was, and nothing else (except perhaps to be stored away, like precious stones as unproductive but undiminishing capital), how could it be a desirable thing to import in exchange for labor products exported? As a matter of fact, it never is.

The commerce of the world does not involve the export or import of money to the extent of 2 per cent of its value. If, said Mr. Crerar, he had shown that all trade consisted of barter, how in the nature of things could the exports exceed the imports? Eliminate money from the computations, and deal with the exports and imports as products other than money, (as the fact is, when the full exchange is completed), and how would the excess of exports over imports be shown? If it be true that an excess (in money value) of imports over exports represents a debt due by the over-importing country to the exporting country, then statistics present this curious anomaly. Taking Mulhall's commerce statistics for 30 years up to 1890, the speaker divided the commercial world into two groups: Those nations that exported more than they imported during the period, and those that imported more than they exported. The sum total represented the gross commerce of the commercial world. He then showed that the grand total of the excess of imports over the exports by the debtor, the over-importing nations, which owed the

difference to these nations which exported more than they imported, because there were no other conceivable creditors, and also the balance which the over-exporting nations had accumulated in their favor during the same period.

After paying the creditor nations all they claimed to balance their trade, the debtor or over-importing nations were left with something like sixteen thousand million dollars of indebtedness; the balance was still against them for that sum on the 30 years foreign business—with no nations left to claim it. Mr. Crerar remarked that he was open to be better instructed on this particular branch of his subject and if his methods of drawing these deductions from figures was erroneous—and he was free to admit that the method was strictly his own and would not be found in any treatise—he would be glad to be corrected.

Mr. Crerar then wound up with a number of references to popular fallacies about the supposed special power and wealth in the form of money as distinct from other wealth of equal value, and urged his audience when considering the great problem of developing trade and commerce, and in drawing inferences from its varying volume, to eliminate utterly the idea of money in a material form as a factor to be considered. All trade consists of barter, the same today as before the flood, and will consist of barter while the industrial world endures.

On motion of A. Alexander a vote of thanks was heartily accorded to Mr. Crerar.

THURSDAY, MARCH 15th, 1900.

Vice-President, J. M. Dickson, was in the chair.

Minutes of the previous meeting were read and confirmed.

Geo. L. Johnston, B. A., was elected a member of the Association.

The programme of the evening was then proceeded with, the first paper being read by Mrs. Rose Holden and entitled "La Guerre des Iroquois."

This paper contained a great amount of valuable memoranda concerning the troubles of the early Indian tribes. Mrs. Holden en-

tertainingly sketched the history of the early struggle of the Iroquois against the Algonquins, Hurons and the French.

She also entered extensively into the struggle of the Iroquois with the Eries, which culminated in the complete absorption of the latter tribe. The tribes of the neutral confederacy, of which the Eries were the chief and most numerous, were settled in this part of Ontario, and in 1616 numbered 39 villages, 4,000 warriors, and about 12,000 souls in all, and had 12 strongly fortified places, the most important being Buffalo.

The Eries were the custodians of the national pipe of peace, which was lighted by their Queen, the great Mother of the Nations. They were the only Indian Confederacy ever governed by a woman. The paper concluded by tracing the origin and course of the war of the Iroquois against the neutral confederacy, which ultimately resulted in the annihilation of the tribe of the Eries.

The next paper was read by Mr. C. R. McCulloch and was written by Mr. Arthur Heming. It was entitled "The Last Fur Brigade." In a vivid descriptive manner, the writer sketched the picturesque trip of the only remaining voyaguers of the Hudson Bay Company, of the Abitibi in the Ottawa river district.

Another of Mr. Heming's interesting papers was read by Mr. McCulloch, entitled "The Riders of the Plains," It was a well written article on Canada's famous body of Northwest mounted police, a body of men who owing to their valor and impartiality and by their hardihood and discretion have won the reputation of being the finest organization of the kind in the world. They are called upon to patrol an area covering 1,000 miles from east to west, and 2,000 from north to south. The spirit of cordiality existing between the police and the settlers enables this handful of men to enforce order over a tract of country three quarters the area of Russia.

Mr. Heming enumerated many stirring experiences in the history of the force, and concluded by paying a glowing tribute to the value of the corps, and commented on the fact that the country over which they exercise jurisdiction has never, since the organization of the corps, had a lynching or a train robbery.

The last paper was read by the recording secretary and gave a

brief and interesting account of the Iroquois Ceremonial of Name Giving. It was written by Mr. J. O. Brant Sero.

THURSDAY, APRIL 5th, 1900.

President Thos. W. Reynolds, M. D., occupied the chair.

Minutes of the last meeting were read and confirmed.

Dr. T. W. J. Burgess was appointed to represent the Association at the coming meeting of The Royal Society of Canada.

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

Dr. R. Bruce Smith then read an interesting paper on the subject of Religion and Insanity.

The paper entered into a careful and learned exposition of many cases of insanity supposed to have been caused by the influence of religious ideals. In these cases it was shown that dogma rather than religion was at the base of the fault, and that in all cases of insanity there must, moreover, be some primary defect in the nervous organism.

An interesting discussion followed.

THURSDAY, APRIL 19th, 1900.

A special meeting of the Association was held with President Thos. W. Reynolds, M. D., occupying the chair.

Rev. J. L. Gilmore, B. D., was introduced to the Association, and read an interesting and instructive paper on the Theology of Plato's Republic. The sources from which the subject was derived were, said Mr. Gilmour, nature, science, human nature and emotions. The essayist divided the subject into five parts, dealing with each separately. These were God, man, sin, salvation and the future.

At the conclusion of the paper a general discussion took place and was participated in by a number of the members.

Wm. C. Herriman, M. D., read a series of Natural History Notes from Mr. Wm. Yates, of Hatchley, which were written in Mr. Yates' usual interesting and instructive style.

THURSDAY, MAY 3rd, 1900.

President Thos. W. Reynolds, M. D., in the chair.

Minutes of the last regular and of the subsequent special meetings were read and confirmed.

Dr. James Russell then read an instructive and thoughtful paper on the subject "Is the Anglo-Saxon Race Degenerating?"

The subjeet was one, the doctor thought, that would bear investigation if for nothing else than to discover what our racial assets were and whether or not there may be an extravagant waste of brain energy which was leading on to mental bankruptcy. The great cosmic forces in operation, as exhibited in the intense intellectuality of the age, manifested in the fierce struggle for national supremacy, the competition among great powers in opening up and taking possession of the waste places of the earth, the subjugation of the weak by the strong, the formation of great corporations and trusts in place of individualism, the intense struggle for wealth and power, the wide diffusion among the masses, the wealth of discovery and invention, the wonderful provision for the weak and degenerate classes as evidencing the altruistic spirit of the age, all these symbolized as never before in the world's history, the mighty expansion of brain power. It was not to be wondered at, that the great masses of the people were unprepared for such an upheaval, and that a large number of the more weakly endowed mentally would swell the ranks of the dependent and degenerate classes.

Continuing the paper dealt with race evolution, referring specially to the progress of the Anglo-Saxon race from the barbarism of 2,000 years ago to the civilization of to-day, the greatest the world has ever known. The lessons of history taught that all the nations of history of which we have any authentic record began to crumble and decay at the very time they reached the zenith of their power and glory, and further, that a proud imperialistic spirit and lust of empire were the immediate forerunners of national dissolution. It was significant to note that there was manifest to-day a growing imperialistic idea in every branch of the Anglo-Saxon race. It was to be hoped that the imperialistic spirit of to-day, chastened and purified by the experience of the past, would prove the harbinger of peace among the nations of the earth. After referring to the causes which led to the decline

of the Roman empire, the doctor pointed out that the Anglo-Saxons had an advantage over the Romans of fifteen centuries of nation building, and greater progress in the art of constitutional government and in the extension of the rights of citizenship.

Discussing the Christian phase of citizenship, the doctor thought this one of the strongest bulwarks of Anglo-Saxon national life. Ancient Empires had their national aspirations, based on a cold and lifeless philosophy, directed to a mode of life conducive to the welfare of the individual, whereas the philosophy of Christ taught the relation of the individual to the community. Civilization was not a matter of mechanical acquirement, but requires many generations to effect a permanent modification of character. Evidence of this was seen in abortive attempts to engraft a 19th century civilization on heathen races. This was the reason there was a race problem in America. The colored race could only be civilized by a long process of evolution.

In the church worship of to-day, the sentimental and emotional sides of human nature were appealed to rather than the spiritual and intellectual, and yet at no time was there ever a broader spirit of humanity abroad than at present. There could be no doubt but that Christian teaching, imperfect though it might be, was the foundation on which the whole future of modern civilization rests.

The literature of a race was a fair criterion of the nation's intellectual vigor, and the Anglo-Saxon race had exceeded all others in the wealth of its literature. The advance in literature, art and science had worked such changes in the world as to overcome the masses, and the harvest of incapables was necessarily large. "We try," said the doctor, "to explain the large increases in our insanity returns by our larger humanity and the ampler provision made for their care, but the mighty upheaval in our social and industrial conditions must be credited with a large and ever-increasing proportion of it."

From the Elizabethan period downward, the pages of English literature had been adorned with the names of men who had made a profound impression on the age in which they lived in moulding the character and habits of the people. John Ruskin's death removed the last of these, and they left no successors, nor does there

appear to be any demand for them. This was an age of literary dissipation. Ninety per cent. of the literature of to-day was fiction, and a good deal of it of a low and impure order. People had no time for deep reading or profound thinking. The mad struggle was for wealth.

After condemning the monopolistic spirit of the age and its many evils as tending to the degeneracy of the race, the paper concluded with the statement that Anglo-Saxon national life would have constantly to be purged and purified of disease if it was to be kept from decay.

"Natural History Notes," from Mr. William Yates, were also read.

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

Report of the Council, by the Secretary.
" " Curator, by Alex. Gaviller.
" " Geological Section, by A. T. Neill.
" " Biological Section, by A. Alexander.
" " Photographic Section, by D. Souter.
" " Corresponding Secretary, by Thos. S. Morris.
" " Treasurer, by P. L. Scriven.

The following officers were elected for the ensuing year:

President, - -	S. A. Morgan, B. A., D. Paed.
First Vice-President, -	J. M. Dixon.
Second Vice-President,	Dr. Herriman.
Corresponding Secretary,	Thos. S. Morris.
Recording Secretary, -	G. L. Johnston, B. A.
Treasurer, - -	P. L. Scriven.
Librarian and Curator, -	A. Gaviller.
Assistant Librarian, -	J. Schuler.
Auditors, - -	F. Hansel and H. S. Moore.

Council: R. Campbell, Geo. Black, J. F. Ballard, W. A. Childs, M. A., J. H. Long, M. A., LL. B.

REPORT OF THE COUNCIL.

Your Council take pleasure in submitting their report for the session of 1899-1900.

The present session has been a most successful one. The attendance at the meetings has been satisfactory, while the superior character of the work of former years has been fully maintained.

Since our last report, there have been held four meetings of the Council and seven of the general Association, at which the following papers were read and discussed:

1899.

NOV. 9th—"Inaugural Address"—President T. W. Reynolds, M. D.

DEC. 7th—"Darwinian Theory of the Tides"—J. A. Patterson, Esq., M. A., 1900.

FEB. 15th—"Money as a Factor in Trade and Commerce"—John Crerar, Q. C.

MARCH 15th—"La Guerre des Iroquois"—Mrs. Rose Holden.

MARCH 15th—"The Last Brigade" and "The Riders of the Plains"—Arthur Heming, Esq.

MARCH 15th—"Iroquois Ceremonial of Name Giving"—J. O. Brant Sero.

APRIL 5th—"Religion and Insanity"—R. Bruce Smith, M. D.

APRIL 19th—"Theology of Plato's Republic"—Rev. J. L. Gilmour, Ph. B.

APRIL 19th—"Biological Notes"—William Yates, Esq.

MAY 3rd—"Is the Anglo-Saxon Race Degenerating?"—Jas. Russell, M. D.

MAY 3rd—"Natural History Notes"—Wm. Yates, Esq.

Dr. J. W. L. Burgess, F. R. S. C., has been appointed to represent this Association at the coming meeting of the Royal Society.

Your Council are pleased to report an increased interest in our Museum among the citizens generally, and more particularly among the students of the City Schools and Colleges, as evidenced by the large number of visitors who avail themselves of the privilege of inspecting the same each Saturday afternoon during the session.

During the session the Council have been in communication with the civic authorities with a view of securing at Dundurn, suitable quarters for the establishment of a Public Museum. Our negotiations, however, are not yet in such shape as to warrant us in making a formal report thereon.

During the year, we, in company with many other Scientific Associations, have had to mourn the loss of a valued member in our distinguished honorary member, Sir Wm. Dawson.

We have had much pleasure in electing to honorary membership, one of our former active workers, Dr. A. W. Stratton, of Lahore University, India.

In conclusion, we would urge on the officers and members generally, the duty of applying themselves actively during the coming recess to the work of their several departments, that each may return with some new problem as material for the coming session.

All of which is respectfully submitted.

THOS. WM. REYNOLDS, *President.*

S. A. MORGAN, *Secretary.*

INAUGURAL ADDRESS.

DELIVERED BY T. W. REYNOLDS, M. D., PRESIDENT, NOVEMBER 9TH, 1899.

Ladies and Gentlemen:

As President of the Hamilton Scientific Association it is my main duty now, strictly speaking, to call the members together with a view to considering how we can best carry on our work this winter.

At the same time, though, it is my privilege to extend to our visitors a hearty welcome to our headquarters, not only on this occasion, but at all other meetings. There are, however, certain obligations incumbent upon me of which the first is to thank you most sincerely for the consideration you have shown me in extending, as you have already done to my predecessors, a second term as your President. Another obligation is that of preparing and presenting an acceptable Inaugural Address. As last year I spoke of our Association's history and its objects, and dwelt particularly upon the value of devoting our spare time to work such as that carried on by our Scientific Sections, I think it would be as well this year to take up another branch.

I propose therefore, to devote my remarks to a consideration of some lines of thought in connection with our Literary work.

This might be taken up in many ways, and as the professional work of a man is liable to influence his tads, I might naturally look at Literature from a medical standpoint, and dilate on its value as a food or a medicine. For although I must admit that I have not reached that point of culture attained by the man who said that when he was low-spirited he always found refreshment in Browning, "still, I think that for different mental conditions there is much benefit to be derived from various books, even if we exclude religious ones. Birrell in one of his essays, says that "Literature exists to please—to lighten the burden of men's lives; to make them for a short while forget their sorrows and their sins, their silenced hearths, their dis-

appointed hopes, their grim futures—and those men of letters are the best loved who have performed literature's truest office."

And here I might use an illustration from Physiology. One of the peculiar properties of the digestive system is its power of rendering tainted food, harmless, but in time, food of that kind will produce dyspepsia. So also it might be said of unfit literature, a healthy mind can make a proper use of it for a time, but even the most healthy is liable to give way at last. In a lecture I heard last summer by Prof. Griggs, of the Leland-Stanford University on the "Art of Living," he said that some nations it is said, can live on Arsenic, but it is a peculiar taste, and some people also could live on lies. So also might it be said of some classes of literature, Charlotte Bronte in speaking of some French novels, remarked, "They leave such a bad taste in my mouth," and like her, I would say it is not only far pleasanter, but also more profitable to read those books that do not strain the literary taste.

However, I would prefer now to offer some suggestions from a standpoint other than that of my own profession, although I might be pardoned I trust, if I borrowed a line of reasoning from it.

I refer to the fact that students of human anatomy and physiology find their investigations much assisted by studies in comparative anatomy, or that of other animals and even plants.

So then to-night, I wish to point out some lines of study that I think might well be conducted as aids to the study of Literature on account of the parallelism of their development and growth.

This parallelism is, I think, especially noticeable in the Architecture and Art of a country, for they are all three closely associated.

When we begin to trace the history of a nation or nations, we cannot but be impressed by the fact that man early found the necessity for Art and also the pressing need of Literature, for unable by his own individual powers to overcome the beasts to which he was born mentally superior, he found himself obliged to communicate with his fellows by other method than that of speech or gesture.

The method therefore adopted was primarily that of hieroglyphics, which were at first pictures, probably of animals conquered in the chase, or to be avoided, as well as of other objects constantly brought to their notice. Each of these pictures became in time corrupted, certain prominent lines taking the place of the whole and

being gradually more and more corrupted and reduced in form, although not in significance, till finally alphabets were formed. This primary use of pictures for signs though thus in time replaced, as far as ordinary purposes of communication were concerned, was by no means abandoned and much curious, interesting and withal beautiful literature is associated with the meanings attached to these emblems. For instance, look at the use made by the ancient prophets and teachers both before and after the Christian era, of various animals, many of them fabulous, such as the siren, the phoenix and the unicorn, to teach various doctrines and mysteries. Similar fables and superstitions were connected with various precious stones, while even to this day the language of flowers is by no means forgotten.

But the great evidence of the parallelism of Literature and Art is derived from their constant association, for although in the ancient monuments of the Egyptians the inscriptions ceased in time to be hieroglyphical, yet they are generally associated with pictures or sculptures forming what might be designated the first known use of illustrations. From that time though, it became constant and we might well say that in transmitting information, when it is intended to be conveyed to the eye, Art is as much a necessity as Literature.

On turning now to Architecture, to begin with, we find that man here also appealed to Nature for his first instruction and has doubtless derived his ideas of protection and defence from that afforded by the rock in the desert, or the spreading cedar of Lebanon. We can also trace in the various orders of Architecture their indebtedness to Nature, for as Emerson says: "By surrounding ourselves with the original circumstances, we invent anew the orders and the ornaments of architecture, as we see how each people merely decorated its primitive abodes. The Doric temple preserves the semblance of the wooden cabin in which the Dorian dwelt. The Chinese pagoda is plainly a Tartar tent. The Indian and Egyptian temples still betray the mounds and subterranean houses of their forefathers—the Gothic church plainly originated in a rude adaptation of the forest trees with all their boughs, to a festal or solemn arcade. No one can walk in a road cut through pine woods without being struck with the architectural appearance of the grove. In the woods in a winter afternoon one will see as readily the origin of the stained glass window in the colors of the western sky seen through the bare

and crossing branches of the forest." These remarks will, I think, particularly appeal to any one who has spent any time in the forest, for he cannot but have noticed Nature's aisles and columns with all their ornaments and intertwining arches and tracery. But the point I would like especially to dwell upon, though in a rudimentary way, is, as I have intimated, the parallelism between Literature and Architecture, especially as found in Great Britain and its history. To begin with the early British and Roman periods, of these there are but few traces, but what architectural remains are to be found are characterized by a solidity which the hands of Time and the storms of ages cannot break down. So also we have in our literature, certain marked features which might well be termed immortal, for in every age they have been utilized, even as we find many modern buildings which present the characteristics of several periods of architecture. The literary features which have been so especially well preserved particularly in English literature, but also in Continental, are the various legends associated with the name of King Arthur and the Holy Grail. If now we pass to the Anglo Saxon style which prevailed from the mission of St. Augustine at the close of the sixth ceutury to the Norman conquest, we find the buildings are plain but substantial and serviceable, the arches being either semi-circular or triangular, while there is little or no attempt at ornament or decoration. So also with the literature of the period which is equally plain and unadorned, but very serviceable and practical. Noteworthy amongst the authors of the period I would mention Bede, so generally known as the Venerable, Caedmon the poor herdsman, who, unable to join in the ordinary songs of his companions, found scope in his beautiful account of the Creation, and above all, I would speak of Alfred, the king who wrote and compiled books on so many useful subjects. The Norman period, which came next and prevailed till tne close of the twelfth century, was noted for an architecture devoted to much ornamental tracery with also a tendency to imitation of the styles in vogue on the continent even as the customs of the period showed a similar tendency. Towards the end of the period the pointed arch came into favor, and the architecture also became simpler, the columns were lighter and showed the first tendency towards a pure Gothic or better English architecture, hence called Early English. So also at the same time we find the English language

coming more into vogue, and a notable poem appearing in it, the Brut of Layamon. This poem although containing many ideas derived from the French, derives a special British significance from the fact that it reintroduces the Arthurian legends. Following the Early English period, which was particularly characteristic of the thirteenth century, we find the Decorated in the fourteenth century, and it is the most beautiful and ornate as its name denotes. During this period literature is equally ornate and presents the pioneers of our great names in both prose and poetry, for during this age we have the writings of William Langland, who wrote under the name of Piers the Plowman, John Wycliffe, and above all, Geoffrey Chaucer, who, in spite of the colour given to his writings by those of Continental authors, is so thoroughly English and truly the father of English poetry. The Perpendicular period which came next, so called because the tracery of the windows and arches is arranged in perpendicular lines, prevailed till the Reformation. It has also been termed the Florid period from the profusion of ornament made use of, and the literature of the period is also more elaborate.

The chief interest though attaches to the fact that during this age printing first came into use in England, and we also have recorded that Caxton printed the 'Morte d'Arthur eight years before he printed any portion of the English Bible, in response he says to a general "demaund"; for "many noble and dyvers gentylmen of thys royame of England camen and demaunded me many and oftymes wherefore that I have not do make and enprynte the noble hystorye of the saynt greal, and of the moost renomed crysen king, fyrst and chyef of the thre best crysten and worthy, kyng Arthur, whyche ought moost to be remembered emonge us Englysshe men tofore al other crysten kynges."

After the Reformation the tendency of the architecture was more and more towards the Classical orders adopted by the Italians, and literature also became more pedantic, although Spencer, Shakespeare and Milton all made use of the Arthurian legends.

In this century even as we find a revival of the taste for Gothic archecture, so there is a demand for the plain, good old English language, and a very prominent place is occupied by the tales of King Arthur and his Court, in the beautiful idylls of the King of the late Poet Laureate. For in spite of their frequent handling through-

out the preceeding ages, they are, thanks to his beautiful pen, if possible more lovely than of old, even as the old flint of the British and Roman builders takes as fine a polish as ever at the hand of the modern builder.

While there is such a parallelism noticeable in the general characters of Literature, Art and Architecture throughout the ages, we must also bear in mind that while all three were at first a necessity as a matter of protection and defence, soon they assumed a religious character. Mr. Boyle showed us in his paper last winter how Man has ever had a desire of commanding. This is shown not only in his deeds and words, but also in his songs and tastes that at first formed the literature, while his first architectural efforts were also with a view to defence, but he soon showed that he had an idea of an Omnipotence that is to be feared and therefore propitiated. From this arose, as higher ideas were formed of the Almighty, the true sense of worship. A good example of this early prominence of religious thought at the same time as the commanding, or in a sense warlike spirit, was shown us in the history of Caedmon and his religious poetry attracting as much attention as the heroic ballads of the time. Following this religious development shown in the building of churches as well as of castles, we find Alfred providing literature of all sorts. So later on after the Reformation, when, as I intimated, thought become more elaborate, we find that architects were able to devote their attentions to mansions that were not mainly intended for castles or places of worship, while the literature was also devoted to the domestic or social side of life. And in our time we are finding that while there is a revival of the admiration for that which was so characteristic of our English ancestors, we have room for ideas in literature and art, not only classical but also that of foreign schools, and we also find literature realizing the aim of King Alfred and Caxton when they sought to provide books for every man.

As I have said so much about the architecture, which is mainly to be found among the older countries of Europe, you will doubtless remind me that we are living in a new country where such is not to be found, truly so, but even as our ancestral heritage was derived rom these countries we cannot do better than to study their literature, architecture and art as best we may.

Now, having laid down these lines of literary study to be followed,

for at the best they are only hints, let us turn our attention for a few minutes to the study of Nature and Science, which our Association claims as such an especial object. On the value of such a study, I think I dwelt sufficiently in my address of a year ago, but while I have dwelt at such length on the intimate association of our literature and art with our inmost natures, we cannot lose sight of the fact that man, when he made his first hieroglyphics from objects presented to him in Nature, was making his first studies in natural history. So also the fact that man banished from Eden had to live by the sweat of his brow, would soon cause him to study the reason or science of those natural processes of growth peculiar to the animals and plants upon which he was dependent for food. Nor should we lose sight of the fact that, in the progress of Literarure and Art, one of the great features of the thought of this century is the attention paid to Nature and its various phrases. We must also bear in mind, that while there is such a need for Literature and Art, we are to obtain it in all directions and should ever have our ears and eyes ready to receive the best from every source, so that we can say with Milton, "Whichever thing we see or hear sitting, walking, travelling or conversing, may be fitly called our book." We should also remember when considering the Architectural side of our history the very apt lines of Longfellow, which are so particularly encouraging to those who may fancy that their opportunities of achieving great results are so very limited:

"All are architects of Fate,
Working in these walls of Time;
Some with massive deeds and great,
Some with ornaments of rhyme.

Nothing useless is, or low;
Each thing in its place is best;
And what seems but idle show
Strengthens and supports the rest."

As regards the work that we as an Association have done, our various sections have not been idle, and while our Geological and Biological workers have taught us much about the Geology, Fauna and Flora of this neighbourhood, equally good work has been done by the Camera section. The work of this section is particularly deserving of commendation, because, apart from the mere pleasure of

taking pictures, it on the one hand encourages a knowledge of Optical and Chemical science, while on the other it cultivates an artistic taste and leads the earnest worker to see new beauties in nature that will much enhance his enjoyment of life.

Let us then continue in our various sections of this great work that we, as a Scientific and Literary Association have taken up, and though we may not have suffered the peculiar temporal reverses of Shakespeare's exiled duke, still we have had our disappointments as regards the non-fulfilment of our ambitions, and as much perhaps those of an educational character, so should be the more ready with him to say:

"Sweet are the uses of adversity
Which, like the toad, ugly and venomous,
Wears yet a precious jewel in his head;
And this our life, exempt from public haunt,
Finds tongues in trees, books in the running brooks,
Sermons in stones, and good in everything."

THE DARWINIAN THEORY OF THE TIDES.

Read before the Hamilton Scientific Association.

BY JOHN A. PATTERSON, M. A.

We are all in some sense familiar with the phenomena of the tides as commonly understood to be the rising and falling of the waters of the ocean caused by the attractions of the Sun and Moon. There come to us many school-day memories when the diagrams in our geography book or those drawn on the blackboard by some long ago preceptor exhibiting circles with elongated wings illustrated to us those diurnal heavings of the bosom of the sea. We may, too, have stood beside the shore and have seen—

> "The Ocean at the bidding of the Moon
> Forever changing with his restless tide."

And we may have watched the rising of the little waves smoothing down the ruffled sand with their soft white hands, and then the ebbing away following that mysterious pull from Sun and Moon which has been working from remote æons of ages. Twice every day, like every God-fearing man in the morning and evening, the ocean, being God-created, lifts itself to heaven and worships, and twice every day after its orison and matin it sinks back to its level and pursues its round of daily service or nightly rest. Those who see this every day phenomenon never think that wrapt up in this are those eternal principles on which the vast problems involving the origin and history not only of our solar system but of other celestial systems depend.

These attractions of Sun and Moon are most easily exhibited in their effects on the water that wraps the Earth, and though the Earth is comparatively solid, yet it is not perfectly rigid, and therefore it is that its shape is even now thus affected, although from their minuteness they may be incapable of registration. But that was not so before "the beginning," when the earth was in her molten or plastic condition, and then it was that the strong hands of her parent Sun

and even those gentle touches from her child, the Moon, helped to mould and carve our Mother Earth, and prepare her for the habitation of sentient and thinking beings. And thus the word "tide" is not merely a rising and falling of the Earth's waters, but has a wider sweep and has a vaster sky line, it must include alternating deformations of a solid and elastic or of a molten and plastic globe. In fact the theory of tides properly investigated and given its proper place in scientific research is a chapter in the unfolding of the vast problem of Evolution, that multiform and brilliant philosophy of the universe which has taken so deep hold of the science and literature of our time. The tide-problem fully studied is another minaret in that glorious temple, the foundation stone of which was laid by Charles Darwin; it is another chord in that great rhythm that proclaims the universality of intelligent law, dethrones blind chance and exalts the Creator working through eternity not by revolutionary dramatic fiats, but by invincible evolutionary purpose and unceasing Providence. And we shall see, too, how where more fully studied this problem deals not only with the question of our past origin but with our future goal, not only with our "whence?" but with our "whither?" and gives rise to many curious and far reaching astronomical speculations.

From the pen of George Howard Darwin, the Plumian Professor in the University of Cambridge, only last year came a book on "The Tides." It is verily a discussion of that problem down to date—a classic, presenting in a popular form the mathematical argument as organized common sense, and smoothing out the intricacies of this most interesting subject. It is a book of nearly 400 pages, illustrated by 43 diagrams, many of them intricate and demanding close attention. A short account of the principles and theory of the book will, it is trusted, encourage my hearers to read more fully and accurately for themselves. Some account of the knowledge the ancients had as to the theory of tides may be interesting. Aristotle and Pytheas of Marseilles, pointed out the connection between the phases of the Moon and the tides. Julius Cæsar whi'e fighting the yellow-haired Gauls took occasion to notice the connection between the Moon and spring tides. He says:—"*Eadem nocte accidit, ut esset luna plena, qui dies maritimos æstus maximos in Oceano efficere consuevit.*" And he tells us how in consequence his ships broke from their

moorings because "*nostris id erat incogniaum*"—his legionaries being accustomed to the navigation of the Mediterranean where the tides are hardly noticable. While Pliny says, "*verum causa in sole lunaque*"—Seleucus, the Babylonian living near the Red Sea, noticed that when the Moon was in the equinoctial the tides followed each other regularly, but when she is not there, but in the solstices, thr height and succession of the tides were irregular, and that this irregularity depended upon her distance from the equator. Modern astronomers would express that by stating that the diurnal inequality vanishes when the Moon is on the equator, and is at its maximum when the declination is greatest. Seleucus must have watched the Atlantic tides where this diurnal inequality is almost evanescent, and he must have observed the tides of the Indian Ocean, especially about Aden, where the diurnal inequality is very great. Kepler indicated that the Sun and Moon moved the water, but his suggestion of gravitation was the merest surmise, and Galileo criticised Kepler in not exhibiting his usual acuteness while he referred the phenomena to the rotation of the Earth.

The true theory of tide generating force was not expounded until Newton, in his Principia in 1687, by his genius established the foundation on which the whole philosophy of tides rests. If I may be permitted to rest and turn aside from the path of serious and honest inquiry, and to drift into Mohammedan romance, I may quote from the prophet "on whom be the blessings of God and His peace," when he says, "Verily the angel who is set over the seas places his foot in the sea and thence comes the flow, then he raises it and thence comes the ebb."

We are all more or less familiar with the ordinary theory of the tides.

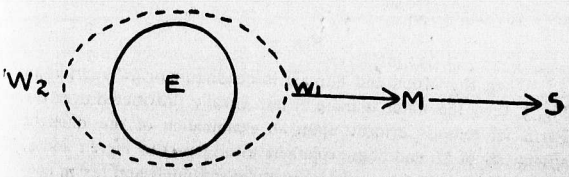


Fig. 1.

When the Moon (M.) and the Sun (S.) are in conjunction as in Fig. 1, their combined attractions lift the volume of water W_1 from the solid earth E and thus a high or spring tide is generated. Furthermore, the same effect is produced at the other side of the Earth inasmuch as the combined attraction of M. and S. pulls the Earth away from the water W_2 and so leaves the water heaped up there, and thus here also a spring tide is generated. This is the position at new Moon on both sides of the Earth.

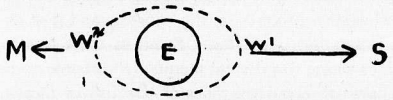


Fig. 2.

When the Moon (M.) and the Sun (S.) are in opposition as in Fig. 2, their attractions are opposed but still spring tides are produced as before. This is so because the sun pulls the water W^1 from the solid mass of the Earth and also the Earth away from the water W_2, and so leaving W_2 heaped up. The Moon has similar effects on W_2 and W_1. This is the position at full Moon on both sides of the Earth—the solar and lunar tides combine just as in Fig. 1.

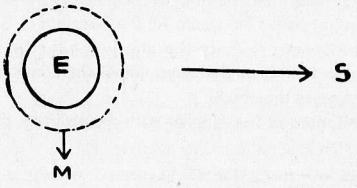


Fig. 3

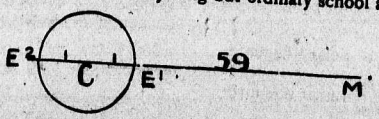
When the Moon and Sun are in quadrature or 90° apart as in Fig. 3, then the water is more or less equally distributed over the Earth for reasons evident upon an examination of the different attractions of M. and S. as explained with respect to Figs. 1 and 2. In this position the Sun and Moon attract separately and not in conjunction, and it is the same whether the Moon is 90° east or 90°

west of the Sun, and so at each of the two half-moons in the month, that is, at the first and third quarters, the neap-tides, which are the lowest, occur.

Furthermore, the lunar tide is the highest, for although the mass of the Sun transcends that of the Moon, yet the Moon is so much nearer that its effect is greater. It must also be remembered that the tidal effect is produced not by the attraction of the Sun or Moon only but by the difference of the attractions exercised by each of these bodies upon the nearer and further sides of the Earth and the water envelope. And as the proportion of the Earth's diameter to the lunar distance is much greater than the proportion of the Earth's diameter to the solar distance the lunar tide is the stronger. These fractions roughly are :—

$$\frac{8000}{240{,}000} \text{ and } \frac{8000}{92{,}000{,}000}$$

As this is an important matter let us get at this proportion more closely. As the tides are occasioned by the attraction of gravitation it is easy to premise that for equal distances the tidal effect must vary as the mass of the attracting body. And if the problem of the tides was simply a question, what is the attractive force exerted by a heavenly body upon another heavenly body as the Earth? The question would be answered by the statement that the effect on the ocean would vary directly as the mass of the attracting body and inversely as the square of the distance of the attracting body. But as has been already said the tide depends not on this but on the differentiation between the attraction on one side of the Earth and the attraction on the other side of the Earth. This is more complicated. Let me proceed to demonstrate the true law without having recourse to anything but ordinary school arithmetic.



Let *C M* represent the distance from the centre of the Earth to the Moon, which is 60 times the semi-diameter of the Earth which we will take as a unit of measurement.

$$E_2C = CE_1 = 1 \text{ and } E_1M = 59.$$

Now the attraction at E_1 exceeds the average

by $\frac{1}{59^2} - \frac{1}{60^2}$ which $= .000,009,49$;

but $\frac{2}{60^3} = .000,009,26$;

$\therefore$ the difference nearly $= \frac{2}{60^3}$.

Again, the attraction at E_2 exceeds the average

by $\frac{1}{60^2} - \frac{1}{61^2} = 000,009,03$;

which nearly $= \frac{2}{60^3}$.

These two over balances are therefore nearly equal and vary inversely as the cube of the distance of the Moon from the Earth. The law therefore is that the tide generating force varies directly as the mass and inversely as the cube of the distance of the mass

or $$F \propto \frac{M}{D^3}$$

To compare the tide-generating forces due to Sun and Moon

Mass of the Sun = 331,000 Earth mass
Mass of the Moon = $\frac{1}{81}$ Earth mass
Sun's distance = 390 Moon's distance

$$\frac{\text{Solar tide-force}}{\text{Lunar tide-force}} = \frac{\frac{331,000}{390^3}}{\frac{1}{81}}$$

$$= \frac{331,000}{39^3 \times 1000} \times \frac{81}{1} = \frac{331}{3^3 \times 13^3} \times \frac{3^4}{1}$$

$$= \frac{3 \times 331}{13^2} = \frac{993}{2197} \text{ nearly} = \frac{999}{2190}$$

$$= \frac{33}{73} \text{ nearly} = \frac{30}{70} = \frac{3}{7}$$

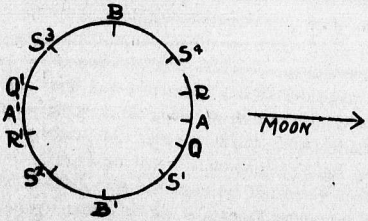
If lunar tide be 1.

Then lunar tide + solar tide = spring tide

$$= 1 + \frac{3}{7} = \frac{10}{7},$$

$\therefore$ Proportion of spring tide to neap tide is as 10 to 4.

A short explanation of what is meant by the priming and lagging of the tides should now be made:



Between new Moon and first quarter, the Sun is over a point S_1 behind A. Here the Moon tends to draw the water towards A, A', and the Sun tends to draw the water towards S_1 and the antipodal point S_2. Therefore the combined action tends to draw the water towards two points Q, Q' between A and S_1 and between A and S_2 respectively, whose longitudes are rather less than those of A and A' respectively. The resulting position of high water is therefore displaced to the west, and the high water occurs *earlier* than it would if due to the Moon's influence alone. The tides are then said to *prime*.

Between first quarter and full Moon the Sun is over a point S_2 between B' and A', and the combined action of the Sun and Moon tends to draw the water towards two points, R, R', whose longitudes are slightly greater than those of A, A'. The resulting high tides

are therefore displaced eastwards, and occur *later* than they would if the sun were absent. The tides are then said to *lag*.

Between full Moon and last quarter the Sun is over some point S_3 between *B and A'*, but the antipodal point S_1 is between *A* and *B'*; hence the *primes*.

Between last quarter and new Moon, when the Sun is at a point S_4 between *B and A*, it is evident in like manner that the tide *lags*.

Hence spring tides *occur at the* Syzygies (conjunction and opposition). Neap tides occur at the quadratures.

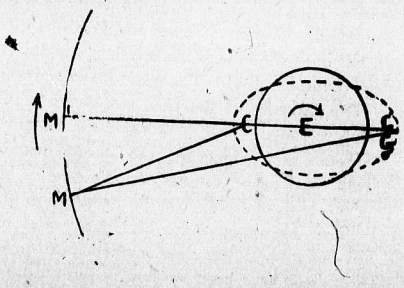
From Syzygy to Quadrature the tide primes.

From Quadrature to Syzygy the tide lags.

All mathematiqians know the difficulty of working out the problem of the three bodies. So complicated is it that it defies the instruments of analysis. The problem of two bodies is capable of exact demonstration. This is somewhat analogous to the difficulty of predicting tides by calculation. If the globe were covered with water to a uniform depth and the friction of continents and configuration of land and the complications occasioned by estuaries and bays and inlets and varying depth of ocean were eliminated, then the tidal problem would be an exact one, but that would be a condition of matters where the solution of this problem would be useless as the Earth's inhabitants would be aquatic creatures whose calm content would not be disturbed by any perplexing inquiries from the "crossgrained muses of the cube and square." Or if the ocean ran in parallel canals belting the Earth and were of uniform depth then the theory of tides and calculations as to tides would be of the most charming simplicity and the happy peoples who would then inhabit the dividing banks could delight themselves with the most gentle exercise. But we must take things as they are and we find most irregular distributions of land and water and varying depths of ocean, and hence the prediction of tides by calculation is one of the most complicated problems of practical astronomy. Theoretically at new and full Moon high water would be exactly at noon and at midnight, but roughly speaking the tides follow the Moon's course so that high water always occurs about the same time after the Moon is on the meridian And as the Sun crosses the meridian with the Moon at new or full Moon the hour of the clock at which high water occurs at such periods is in effect a statement of the num-

ber of hours which elapse between the Moon's meridional passage and high water. This is called the "establishment of the port" and is constant for any particular place. Thus the establishment of the port at London Bridge is 1 h. 58′, so that lunar high water occurs 1 h. 58′ after the Moon's transit—and the same with the solar high tide. The actual high tide being due to Earth and Moon conjointly is earlier or later than the lunar tide by the priming or lagging. By adding a correction for this to the "establishment of the port" the time of high water may be found for any phase of the moon.

Knowing, as we do, the effect of gravitation, and knowing, too, that the Earth and Moon and planets are nearly spherical in shape, we conclude that these bodies were once molten and plastic. A swiftly moving fly wheel will continue to revolve for a long time after the moving force has ceased to operate. Its inertia will carry it on, but the friction upon its bearings, the Earth's attraction and the resistance of the air will at length reduce it to rest. The Earth has no bearings, but yet the tidal friction applied as it is to its surface acts as a brake, and must thus retard the Earth's rotation, and as by Newton's Third Law of Motion, action and reaction are equal and in opposite directions it must follow that as the Earth is retarded the moon is accelerated. This proposition, however, demands a more careful investigation.



Let the circle represent the normal shape of the Earth rotating in the direction of the curved arrow. Suppose the water envelope or the plastic mass of the Earth to be devoid of friction and to take

the shape represented by the ellipse, and at this moment let the Moon be at M_1. But in fact there is friction and the crest of the wave or the protuberances of the ellipse is belated and, therefore, carried onward by the Earth in her rotation beyond the proper position. To put the figure right and avoid confusion, let the Moon be set back to M which is the proper relative position when the effect of friction and rotation are taken into account. What now is the effect of the Moon upon the egg-shaped Earth? Suppose the tidal protuberances to be centralized in and represented by two masses at C and C_1, respectively. Now it is evident that the attraction of M on C tends to retard the Earth and the attraction of M on C_1, tends to accelerate it. And as C is nearer to M than C_1, it must follow that the retarding pull is stronger than the accelerating pull. Therefore, it is clear that the first effect of fluid friction is to throw the tidal protuberances forward, and the second effect is to retard the Earth's rotation. Action and reaction are equal and in opposite directions, and as the Moon pulls the tidal protuberances they in turn pull on the Moon and therefore the Moon is carried forward in the direction of the arrow. This increasing force will force the Moon out to move in a spiral curve at ever increasing distances and thus the time of the Moon's revolution is increased. And not only so but the effect of this accelerating force is actually to retard the velocity. Thus for both reasons the length of the month (the time of the Moon's revolution round the Earth) is increased. The same result has been shown as to the length of the day (time of Earth's revolution round her axis). The result may be presented in another form. The attraction of the tidal protuberance increases the Moon's aerial velocity. Now in a circle the aerial velocity $V \propto \sqrt{R}$. Therefore as V is increased the Moon's distance R is gradually increased, and hence also her periodic time or month is increased. This is true theoretically, but the investigation of astronomical records since observations have been made does not offer much or any corroboration to the rigid mathematical proof—the changes for centuries past have been so slow. But it does not follow that this has always been so. When the Moon and Earth were gifted with more juvenility in the remote ages relative changes were far more rapid. Let us remember that the tide-generating force

varies as the inverse cube of the distance between the Moon and the Earth, so that if the Moon's distances is reduced $\frac{1}{2}$, $\frac{1}{3}$ or $\frac{1}{4}$ of its present distance then the force and the tide generated would be 27, 64, 125 times as great. This is, however, only half the truth. We must not forget that while tide is being augmented the Moon's attraction is also increasing. These two coalesce and each is increased as the cube of the distance decreases, so that the cube power must be squared or made the sixth power. The tidal retardation of the Earth's rotation therefore varies inversely as the sixth power of the Moon's distance. For example, when the Moon's distance was reduced to $\frac{1}{10}$ of the present distance then the tidal action was 10^6 or 1,000,000 times as great as at present. The action at present may be slow enough but when the Moon was nearer us it went on with immense rapidity. Looking forward in point of time we will reach an era when the earth will take about 1,400 hours to turn on her axis, and the Moon will take the same time to make a revolution round the Earth. The result will be that the Earth and the Moon will go round their common centre of gravity as if united by a solid bar and locked together in about 55 of our present days with the day and the month identical in length. The lunar tides will then cease, and any retardation of the Earth due to the Moon can then no longer exist. Solar tides will, however, continue to exist so long as water is left on the Earth. The solar tide will thus retard the Earth's rotation and so further lengthen the day; this will retard the Moon's motion and diminish her aerial velocity. The Moon will therefore approach the Earth and will ultimately fall into the Earth in a long, ever-contracting sweep. The Earth will thus finally turn the same face to the Sun, and so remain locked with perpetual day over one hemisphere, and perpetual night over the other. As the system can be traced forward to the 55 day period, so it can be traced back until we find the Moon revolving round the Earth and almost touching the Earth in a period of between three and five of our present hours. And thus beauteous Luna had her birth from the fiery Earth æons ago, when in the throes of a world's parturition she was thrown off to seek her fortunes in the universe and work out her destiny as our satellite, once doubtless a flower-spangled world, with refreshing streams and heaving oceans and gentle breezes, now a derelict, a ruined world. In the ages yet to come whose

number can alone be reckoned in the arithmetic of heaven, this fair daughter born of her Earth-mother will in a long, circling spiral come back again and gently, like a fallen blossom from one of Earth's flowers, fall back on the bosom of her parent not with a crash of colliding spheres and the heat of riven globes, but softly make her grave where her cradle was in the long ago past.

The effect, therefore, of solar tidal friction is to retard the revolution of the Earth while the revolution of the Moon in her orbit will increase. Until recently no case of a satellite having a less period than its planet's rotation appeared to exist, and it was therefore argued that the theory was unsound, as not being borne out anywhere in visible nature. But in 1877, Professor Asaph Hall discovered two satellites of our neighbor Mars, which he named Phobos and Deimos—Fear and Panic, the dogs of war. The period of Deimos is about thirty hours, and that of Phobos something less than eight hours, while the Martian day is something like twenty-four hours. Here then is an illustration of the future condition of our Earth-Moon system for the solar tidal friction having such an effect upon Mars which is so much nearer the Sun than our Earth has slowed him down so that Fear circles him round nearly three times every day, which would surely be enough to drive all the warlike spirit out of him. The ultimate fate of this satellite will therefore be absorption into his planet. The Mars-Phobos system is therefore further advanced and it will remain for astronomers in coming centuries to discern any approach of Phobos to his parent Mars.

If Darwin's theory be true we would naturally turn to Mercury and Venus and see what effect solar tidal friction has had on their rotation periods. As the solar-tide raising force varies inversely as the cube of the distance of the planets, these solar tides are far greater on Mercury and Venus than on our Mother Earth. Although younger in point of years than Terra, as indeed would become the Queen of Beauty and the swift-footed messenger of the gods, yet as Sun-plant systems they are older because their gradations are farther advanced. It would therefore be reasonable according to the theory that we are investigating that the immense solar tides must have diminished their periods of rotation that they are united as at the end of a bar with the Sun as obtains in our Earth-Moon system and so like loyal courtiers they keep their faces always turned to the

Sovereign Sun. The keen-eyed Schiaparelli of Milan has announced such to be their relative condition as the result of his observations, and these have been corroborated by Percival Lowell and T. J. See, working at Lowell Observatory at Arizona, under the very best atmospheric conditions.

The theory of tidal action has an important place in the evolution of celestial systems. The nebular hypothesis as suggested by Kant and developed by Laplace and modified by G. H. Darwin and Poincaré is the most reasonable theory of evolution yet presented. Time forbids more than a passing reference to it. Apart from any hypothesis based on the dynamics of a rotating nebula, and the evolution thereirom accompanied with the attendant phenomenon of tidal friction it is interesting to note that very recent investigation of the great nebula in Andromeda seem to indicate the lenticular shape with its central condensation, the annulation of the outer portions and even the condensation in the rings which are destined to form planets. The Scriptures of the sky, therefore, appear to reveal to us Nature in parturition, and a celestial system being evolved before our very eyes in the great nebula of Andromeda. By the theory of tidal friction our Moon took her origin very near to the present surface of the Earth. To account for the orbits of the satellites of Mars, Jupiter, Saturn and Neptune, we must have recourse to the nebular hypothesis. The Earth-Moon system is unique. The Earth is only 80 times the weight of the Moon, while Saturn weighs about 4,600 times as much as its satellite Titan, which is the giant satellite of the solar system. All other satellites in other systems but ours are infinitesimally small in comparison with their primaries. As a reason explanatory of this peculiarity of the Earth-Moon system it should be remembered that the Earth is nearer to the Sun than any other planet attended by a satellite. By the nebular hypothesis rings are, so to speak, shed from the central nucleus when the nebula has contracted sufficiently to create a proper degree of increase of rotation. If from any external cause this rotation is retarded then the genesis of the ring is retarded or indeed may be entirely prevented. The friction of the solar tides furnishes this external cause. We therefore find that Mercury and Venus have no satellites, the Earth has one, Mars two, Jupiter five, and all the exterior planets

have each a retinue of satellites. In the Earth system the genesis of the moon was retarded by the solar tidal friction but not actually prevented.

The phenomenon of double stars presents a special study in the investigation of tidal phenomena. It is impossible that so many systems of double stars should have attained their relative positions by an accidental approach from the infinite depths of space. Tidal action tends to increase the eccentricity of the orbit in which the bodies revolve about one another and the results are much increased when the two bodies are not very unequal in mass. It is remarkable that spectroscopic observations show that the orbits of the majority of the known "doubles" are very eccentric. Tidal friction causes, too, a repulsion between the bodies and so as in the Earth-Moon system, the two members of a binary system must once have been close to each other. The next step is the rupture of the parent nebula in the form of an hour-glass into two detached masses, as witness the great dumbell nebula (27 Messier Vulpeculæ). Dr. T. J. See's observations and ingenious theories have done much to develop this philosophy of Dr. Darwin's ; let us remember that conjecture is the parent of discovery and often the grandparent of truth. Future researches with the photographic plate, the spectroscope, and the telescope, and their results interpreted by skilful astronomers, will open to us yet marvellous vistas of observation ; like the Queen of Sheba we may yet have occasion to be startled with many sparkling gems of discovery and exclaim that the half was not even dreamed of.

Tidal action has been in the mighty hands of the great Sculptor the instrument by which he has hewed out the outlines of our globe, working out new beauties, softening down harsh lines, and reducing her more and more fit for the habitation of man. Mother Earth sent forth her daughter Moon ages ago, and since then, obedient to Earth's impulses, and never leaving her, she has with strong but gentle hands, moulded Earth's plastic form into shapes and curves, and worked out with its wondrous friction coupled with Earth's internal forces these configurations of ocean and continent that are now with us. And since Earth became in a sense solidified, the Moon has kept the oceans moving and heaving and health-giving, deftly shaping and rounding the fulness of her beauty. Many times

Earth's face has changed and it is changing yet; lands have been swept away and seas wash in the palaces of former kings.

There rolls the deep where grew the tree,
O Earth what changes hast thou seen!
There where the loud street roars hath been
The stillness of the central sea;
The hills are shadows, and they flow
From form to form, and nothing stands,
Like mists they melt, the solid lands,
Like clouds they shape themselves and go.

THE NEUTRAL NATIONS.

THE ERIES.

Read before the Hamilton Scientific Association

BY MARY E. ROSE HOLDEN.

"Who then lives to mourn us? None.
What marks our extermination? Nothing."—SENECA.

"Not Hindoo, Afgan, Cushite or Parsee,
The Indian his own prototype must be."

The occupants of the shores of this lake by the ancient and extinct tribe of the Eries, who were once the acknowledged pacificators of the neighboring Indians, and who preceded the Iroquois in warlike and civic power within that basin, gives a melancholy interest to whatever in the existing archaeological remains of the country, serves to restore the memory of their power.

They appear to have been in the plentitude of pre-eminence and of a civilized strength and influence at the period of the first discoveries of the French in the beginning of the seventeenth century. The Wyandot-Hurons at that time had not been disturbed from the possession of their ancient territories on the shores and valley of the St. Lawrence. The Eries seem to possess unique claim to remembrance, which cannot be urged by any other American tribe—a claim still older than the days of Hiawatha, viz.: that of kindling the Council Fires of Peace for all the tribes of the continent.

According to the French Missionaries, the Eries were at the head of the *singular league known as the Neutral Nations.* Their territory extended from the extreme west to the eastern shores of Lake Erie, including the Niagara valley, and of whom the Kau-Kuas, of Seneca fame and tradition, were manifestly only one of the powers. The dispersion of the Eries, according to European writers, took place in 1656; according to Cusick that event occurred at the time of Cabot.

The following facts are well authenticated: The Neutres kept their neutrality until 1634; they had 36 villages in 1641 and a gar-

rison of 4,000 warriors, with a total population of 12,000. The first breach of the Covenant was followed by a truce for nine years.

Their history, rise, spread and power and final fall is involved in a degree of obscurity which is all the more stimulating from the few gleams of tradition given. There is no doubt that the Institution of the Pipe of Peace Council must have been subject to a very delicate exercise of authority, and which was also often fluctuating in its power, it was finally overthrown by some indiscreet act. The power to light this pacific fire is represented as having been held by a woman, and after its final extinction in the area of western New York, it was equally clear that hereafter it began to flicker. It was finally put out in terrible bloodshed by the increasing and conquering Five Nations. The fate of the Eries has excited deep interest, and they are still brought to mind by the noble lake and its noted outlet the Falls of Niagara, the lake which still bears their once distinguished name.

They possessed twelve large forts, which were similar to the cities of refuge of the children of Israel. The country was noted for its fertility, game of every kind abounded, and fruits of sunny France flourished in the open air. The Eries were regarded as the Pacificators or Peace Councillors of the many tribes and confederacies which waged war so furiously one with another north, south, east and west of them. In the year 1626 they were ruled by Queen Yag-owanea, "Mother of Nations."

She was called "Gegosasa" by the French and Senecas. They spoke a dialect of the old Huron-Iroquois race, in morale and religious belief, that of living under a Theocracy, they also agreed with these Romans of the New world. The Eries occupied geographically a significant position, their territory lay intermediate between all contending parties—red and white—the various Indian confederacies, as well as the rival European powers in the race for supremacy on the continent. They had already from propinquity and from a certain community of habit, and in spite of their supposed perfectly established neutrality between the powers, been drawn into a secret friendship with the Mississagies who dwelt on the west and north of Lake Ontario. Totemic ties of consanguinity, as well as the sacred trust of Kindler of the Peace Fires of the continent, should have kept Gegosasa true to her guardianship and faithful to her vows of vir-

ginity, trust and vows which required greater wisdom than this last Queen of her dynasty possessed.

The first war was caused by an act of perfidy, and from the account given by David Cusick, Yagowanea, was in some respects another Zenobia. But Yagowanea sacrificed an empire of neutrality to the passion of love she entertained towards a Mississaga Chief.

There is a good deal of evidence given among many nations of this continent that the order of Vestal Virgins was a recognized one among the N. A. Indians. This summer, 1899, while visiting Medad, I heard the following tale, scarcely yet has time elapsed to dignify it into tradition :

When the vicinity of Medad was first being searched for relics, some delvers in their diggings on a knoll overlooking the weird waters and their surroundings, came across a solitary grave which held the skeleton of a woman—what was left of her mouldering cerements and the crumbling bones exposed to the open air were all that remained of a woman of rank. By what token, or by whom first whispered, it is not known, but 'tis said, "through loss of her "virtue, this woman was buried in a lonely grave, her remains not "being thought worthy of burial in the communion 'pit,' of family. "tribe or race."

According to Horatio Hale, "It is likely that the Eries separ- "ated from the parent stock earlier than the Iroquois, and that "they were thus enabled for a time to avoid becoming embroiled in "the quarrel between the two great divisions of the race." Of this we are certain, that they were the first to turn their steps southward, cross the Canawaga (St. Lawrence), then turn their faces westward, and follow the setting sun, finally settling down in the rich fields and fruit lands of the central peninsula of Canaiderada, the country of "big lakes and rivers." Father de La Roche, a Recollect, passed the winter of 1626 with the Neutre, Erigh or Cat nations—the first Frenchman who came in contact with the important neutral confederacy occupying the present Niagara escarpment. Most of the villages were on the west side of the Niagara river, their country being the ordinary, neutral passage way between the Iroquois and the Hurons—sworn enemies. On all early maps the Erie cities of refuge, situated on Lakes Erie or Ontario, were at some distance from both lake and river, they were found some miles away from the

water in order that they might not be surprised from sudden attack.

Father de La Roche, in his first attempt to Christianize the Indians, notes the peculiarity which distinguished the Eries from all the other nations of America—the astounding peculiarity of neutrality between fierce and ever contending nations. They spoke a dialect of Iroquois in the western, and in the northern cantons the dialect was of the Huron type, while on the banks of the Niagara a very close relationship existed with the Seneca speech.

This is the only confederacy which we read of in America, which was governed by a woman. According to David Cusick in his history of the Five Nations, first published in 1825, the final destruction of the Eries was caused by an act of perfidy. The wampum and peace pipe of the Mother of Nations was held sacred; all who sought the shelter of her lodge were considered safe from their pursuers until such time as the question in dispute should be discussed by representative chiefs from the nations representing the litigants, the Queen, through virtue of her office, rendering judgment on the case, a verdict from which there was no appeal.

The central point of her authority was a place called Kiouka, on the Niagara ridge and not very far from the present village of Tuscarora. Protected by the sanctity of her office, a reputation which seems to give evidence of the truth of the assertion which has been made that the order of *Vestal Virgins was a recognized one among the N. A. Indians, she had a council house and a contiguous building, where she received messengers and ambassadors from the Five Nations, the Wyandot (Huron), Mississagies and others. Her lands extended to the foot of Lake Erie and along the head of Lake Ontario. Near the "head of the lake" (Ontario), an outrage occurred, which she caused summarily to be punished, and which led to the fatal breach of neutrality. The Seneca warriors had been received and had begun to smoke the pipe of peace when a deputation of Mississagies were announced. These latter informed the queen that the two men before her had just returned from assassinat-

*NOTE.—This is a tradition corroborated by the fact that the Indians still shows some medicinal plants which they say are very salutary, but which have no virtue unless administered by Virgin hands.

ing their noted chief, the queen's lover. They demanded the right of blood, and this demand was instantly granted, though in violation of the sanctity of her lodge as a place of refuge. The Senecas were put to horrible death by the Mississagies. Intelligence of this breach of procedure in the queen's office spread in every direction. The Iroquois, the aggrieved party, flew to arms. The Queen, when her frenzy of grief had time to calm, realized what in her temporary oblivion of all around her she had jeopardised for herself and people—she knew what awaited her at the hands of the Iroquois—but the warlike instincts of her forefathers rose to the occasion. She at once dispatched messengers to Onondaga to explain her position and to modern Buffalo, her chief garrisoned city. She also appealed to the War-an-ak-arana (Andastes), who were encamped then on the banks of Lake Erie to come to her assistance. She went herself to Buffalo and at the head of a very large force of warriors proceeded rapidly towards the Genesee river where the first engagement took place. She was met by fifteen hundred Senecas under Shorikowana, a most noted Seneca warrior. The two parties met about midway between Canandaigua lake and the Genesee river, and near the outlet of two small lakes, near the foot of one called Hon-ey-oye, the battle was fought.

When the two parties came in sight of each other, the outlet of the lake only intervened between them. The entire force of the Iroquois was not in view of the Eries. The reserve corps of one thousand young men had not been allowed to advance in view of the foe. At sight of their opposing force on the opposite side of the stream, the Eries impetuously rushed through the water and fell on the enemy with tremendous fury.

Notwithstanding the undaunted courage and bravery of the Iroquois they could not withstand such a terrible onslaught, they were compelled to yield the ground on the bank of the stream. The whole force of the Iroquois, except the corps of reserve, now became engaged; they fought hand to hand and foot to foot; the battle raged horribly, no quarter was asked or given on either side. As the fight thickened and became more and more desperate, the Eries for the first time became sensible of their true position. What they had long feared had become a fearful reality. *Their enemies had combined together for their destruction*, and they now found themselves

engaged suddenly and unexpectedly in a fearful struggle, which involved not only their high prestige as arbitrators of America, and also as the glorious custodians of the National Pipe of Peace, but the fate of their national existeuce now hung on the issues of the day. They were intensely proud, the word of their Queen, "Mother of Nations," had from immemorial time been unquestioned law—a power felt and a superiority acknowledged by all the surrounding tribes. All these considerations flashed upon the minds of the bold Eries, and nerved every arm with almost supernatural strength and power.

On the other hand, the united forces of the once weaker tribes, but seventy years joined together as a league and confederacy by Hiawatha, and made strong in their union, fired by a spirit of emulation and excited to the highest pitch among the warriors of the different tribes brought for the first time to act in concert; inspired with zeal and confidence by the counsels of the wisest chiefs, and led on by the most experienced warriors of all the united tribes, the five nations were invincible. Though staggered at the first desperate onslaught of the Eries, the Iroquois soon rallied and made a stand, and now the din of battle rises higher and higher, the war club, the tomahawk and the scalping knife, wielded by herculean arms, do terrible deeds of battle and death. During the hottest of the conflict, which was fierce and long, the corps of reserve, amounting to one thousand young men, were, by a skilful movement under their experienced chief and leader, placed in rear of the Eries on the opposite side of the stream in ambush. The Eries had been driven seven times across the stream and as often regained their ground, but the eighth time at a given signal from their leader, the corps of reserve in ambush rushed upon the almost exhausted Eries with a tremendous yell.

Shorikowana, the Seneca war chief, was, fortunately for the Eries, killed by an arrow, when Gegosasa proposed terms of peace, which were accepted, and the remnant of her warriors, bearing with them their wounded and as many of the dead bodies of their leaders as they could find, returned to Buffalo. This first war ended in 1634. Upon her return home Gegosasa found internal affairs in a terrible condition. The campaign from which she had just returned proved n the long run the destruction of the neutral Confederacy. Prophets

and Seers in this crucial hour foretold the downfall of Indian supremacy on the continent, dreams were dreamt, visions were seen, woe and the crying of women filled the land, for now the glory and prominence given to the women of old Canada was lost forever, henceforth woman would be degraded, and in her humiliation walk with downcast eyes and in humbleness of spirit until the hour of her redemption sounded.

Distracted by these prophecies and their implied reproaches on her conduct, self-accusations swiftly followed in their train. The stings of an aroused conscience now rent her soul. Where once quarrels and disputes had been settled by peaceful council and arbitration, feuds and seditions ruled, her reign as arbitrator was ended, her influence and claims to be regarded as the judge of her people's rights and wrongs were openly jeered at and derided, her wishes once law were set at naught and disregarded.

"Were these really truths which were daily being hurled at her "as she endeavored to resume her old home life?"

"Had she indeed been the first to set the law of antiquity at "defiance? Was it not owing to her failure in preserving the laws "governing totemic, joined to the violation of her vows of virginity, "that had brought on such disastrous results?"

These and similar questions tortured her soul with the spirit of despair, but at last her courageous spirit whispered hope, "All is not lost," and she vowed yet again that if repentance and atonement could wipe out her bitter shame, that on her part should be done. She determined to make a last appeal to the neutre nations to rally to her standard, beacon fires were lit, and her runners sent forth to summon a grand council. She there confessed her sorrow and bitter repentance, and appealed to the noted chivalrous spirit of her audience for volunteers to aid her in recuperating their losses. Accompanied by her vestals, noted women, counsellors and the chief warriors who still remained loyal to her, she retired to Buffalo. The flower of the nation left her after the first war, those still faithful and believing with their dethroned Queen that "all was not lost" for them, numbered fifteen hundred warriors; these left the disaffected in possession of the central and western towns of the peninsula and gathered themselves around their Queen at Teosah-wa (Buffalo).

The Secessionists were composed of bands of young warriors

under no united leadership; each clan, under its own elected chief, strove for the mastery over the others in hopes of winning ultimate supremacy.

Adventurous hunters and builders of canoes joined their ranks. The flint arrow makers had followed the queen. Physically both parties of the divided Neutre Nations were the finest body of men on the continent.

This faction having thrown to the winds the most sacred traditions of their forefathers now gave free indulgence to their worst passions. As through the act of their queen failure and loss of prestige had fallen upon them, the sex which had hitherto been so venerated and chivalrously held in their estimation and conduct, should thereafter be degraded and made to suffer. As a nation they had lost standing and rule among nations through the weakness of a woman; the law regarding restitution governing their national procedure should now, proportionately, be put into effect regarding women. In the tribal communal respect and veneration was paid to women among all North American Indians, in respect to prisoners who were tortured to death women were not to be subjected to the agonies of fire. This law was now broken. The revolted Neutrals not only caused female captives taken in their raids but also of their own women whom they knew or suspected still sympathized with Gegosasa to undergo the atrocious torture of fire, but delighted with fiendish revelry in their suffering death cries.

The richness and fertility of their soil—the abundance of vegetables, fruit and game to be found without almost any exertion—left the duty of providing entirely to the women. Now that the men felt free from any tribal or national obligations to lead respectable lives, they gave themselves up to the enjoyment of every animal instinct. Luxury and self-indulgence has ruined more than one nation which, unchecked by moral law, rendered no homage to, or destroyed the spiritual nature of woman.

Decadence rapidly followed this new mode of life.

A generation of sloth, gluttony and licentiousness of the most depraved character, with now and again as a bloody pastime, rousing themselves to perpetrate cowardly and ferocious raids against weaker tribes of the Algonkin race living to the west of them, brought on swift retribution.

The Mascoutins or "Fire Nations," the people who worked the ancient copper mines of Lake Superior, dwelt on the west side of the river Detroit. It was on these people that the Neutral Secessionists, aided by the Ottawas, now warred. (June, 1642). At the head of the largest combined force of warriors they could muster, they marched against the Fire or little prairie people. They attacked a fortified fort, garrisoned by nine hundred warriors, who bravely sustained the attack, but after a siege of nine days the Mascoutins were forced to surrender. A large number were killed during the siege, four hundred were taken prisoners, four hundred women and children shared the same fate and after having tortured the prisoners, burned the women, gouged the eyes and girdled the lips of the old men of the country, they abandoned their unfortunate victims in their helpless misery to a tragic existence and death.

When the Iroquois heard of these atrocities they met to the number of 1500 men, crossed Gegosasa's diminished territory and in rapid succession, entered village after village of the Secessionists. The greatest consternation ensued, villages were abandoned and the inmates pursued by the conquering Romans of the new world. After being hotly pressed and pursued by the Iroquois, over 2000 warriors, besides women and children were destroyed. Famine and plague destroyed this remnant of the Neutral Nation. The central and western country was devastated.

The Iroquois returned home, taking with them prisoners reserved for adoption or fire.

Meanwhile at Buffalo, Gegosasa still held sway as Queen of the Eries. The Kaw-Kaws, the largest tribe of her old Confederation, remained loyal to her. Their lands stretched from eighteen mile creek (Jordan), along the north shore of Lake Ontario. Near the "head of the lake" on the north-west of Burlington Bay, was stationed their village of Medad, built on the hill overlooking the small lake of the same name.

The ruins of this village visited by the early explorers and Jesuit Fathers, are still to be seen surrounded by much of their primitive beauty and natural loveliness. The spell of nature overshadowing the weird surroundings is cast in a minor key ; the basin or crater of some long extinct volcano whose formation justifies the belief, forms the small, but ancient lake. The basin is placed away up on the

hills, behind the valley of the bay, and by hard measurement, bottom is not struck until a depth of nearly eighty feet. All around the lake basin is a marsh or bog land, so soft in places that in spring time a pole may be thrust down into it to almost any depth. Lake Medad and its immediate vicinity was in a past age of the world's history one of the great gathering places for Indian peoples of Ontario, they loved the spot, and not only loved and lived, but buried their dead there.

At the first council which the queen held after the Genese engagement, the Eries decided to employ their time of truce in training their youth in every possible warlike exercise, in order to make themselves ready when the opportunity offered to retrieve their lost position with the Iroquois. Still confident in their superiority over any one of the tribes inhabiting countries within the bounds of their knowledge, they trusted in what they believed to be their own inherent greatness, to re-assert themselves eventually with the Five Nations. No protest was therefore made when deputies sent from Onondaga requested "right of way" over her possessions when the Iroquois set out to revenge the Mascoutin butcheries. Gegosasa still nursed her projects for the future, and present peace must be had at all hazards. There also remained little doubt in her mind of the results of an encounter between the warriors of the Great League of the United Households, and her own undisciplined, debased old Covenanters. Better far that those who had once called her "mother," should meet their deserved punishment from the flail of the Iroquois, than that she should be forced to enter into matricidal war.

The overwhelming success of the Iroquois campaign, taught the Eries that this new confederation of tribes, any one of which might be almost an equal match for her people and of whose personal prowess they had witnessed on the Chinisseo, a prowess and fame heightened by the masterful manner in which the rebellious Neutrals had been swept out of existence, inspired Gegosasa, her councillors and warriors with most anxious forebodings. To cope collectively with them, seemed to be now an impossible feat. The only hope of the Eries, therefore, lay in being able, by a series of subtle strategic surprises, to destroy the Five Nations in detail.

It was the year of 1655, that the Eries sent a friendly message

to the Senecas, who were their nearest neighbors, inviting them to select one hundred of their most noted athletes to play a game of ball against the same number to be selected by the Eries, for a wager that should be considered worthy the occasion and the character of the nation, in whose behalf the offer had been made. Now hitherto, the Eries had been the acknowledged champion athletes of the continent; in all hand and foot struggles they were unequalled.

The message was received and entertained in the most respectful manner. A council of the Five Nations was called and the proposition fully discussed, and a messenger dispatched with the decision of the council respectfully declining the challenge.

This emboldened the Eries, and the next year the offer was renewed, and after being again considered, again formally declined.

This was far from satisfying the proud lords of "The Great Lake," and the challenge was renewed the third time. The blood of the young Iroquois could not be restrained. They importuned the old men to allow them to accept the challenge, and the wise councils which had so far prevailed at last gave way, and the challenge was accepted.

Nothing could exceed the enthusiasm with which each tribe sent forward its chosen champions for the contest. The only difficulty seemed to be to make a selection where all were so worthy. After much delay, one hundred of the flower of all the Five Nations were fixed. An experienced chief was chosen as the leader of the party, whose orders the young men were strictly enjoined to obey. A grand council was held at Onondaga, and in the presence of the assembled multitude, the party was charged in the most solemn manner, to observe a pacific course of conduct towards their competitors and the nation whose guests they were about to become, and to allow no provocation, however great, to be resented by any act of aggression on their part, but in all respects to acquit themselves in a manner worthy the representatives of a great and powerful people, anxious to cultivate peace and friendship with their neighbors according to the teachings of Hiawatha. The party then took up its line of march to Teosahwa. When the chosen band had arrived in the vicinity of the point of their destination, a messenger was sent forward to notify the Eries of their arrival, and the next day was to be set apart for their grand entree. The elegant and athletic forms, the tasteful

yet not cumbrous dress, the dignified, noble bearing of their chief, and more than all, the modest demeanor of the young warriors of the Iroquois party, won the admiration of all beholders. They brought no arms. Each one bore a bat, used to throw or strike the ball, tastefully ornamented, being a hickory stick about five feet long, bent over at the end, and a thong netting woven into the bow.

After a day of refreshment, all things were ready for the contest. The chief of the Iroquois brought forward and deposited upon the ground a large pile of costly belts of wampum, beautifully ornamented moccasins, rich beaver robes, and other articles of great value in the eyes of the Indians, as the stake and wager on the part of his people. These were carefully matched, article by article, by the chief of the Eries—were won by the Iroquois, who bore off their prize in triumph. Thus ended the day.

The Iroquois having now accomplished the object of their visit, proposed to take their leave, but the chief of the Eries, addressing himself to the leader, said, their young men, though fairly beaten in the game of ball, would not be satisfied unless they could have a foot race, and proposed to match ten of their number against an equal number of the Iroquois party, which was assented to, and the Iroquois were again victorious.

The Kaw-Kaws, who resided at twenty-mile creek (Jordan) being present as friends of the Eries and umpires of the games, invited the Iroquois to visit them before they returned home, and thither the whole company repaired. The chief of the Eries evidently dissatisfied with the result of the several contests already decided, as a last and final test of the courage and prowess of his guests, proposed to select twelve men to be matched by the same number to be selected from the Iroquois party to wrestle, and that the victor should despatch his adversary on the spot by braining him with a tomahawk, bearing off his scalp as a trophy. This proposal was not at all agreeable to the Iroquois. They, however, agreed to accept the challenge with the determination—should they again be victorious—not to execute the bloody part of the proposal. The champions were accordingly chosen. A Seneca was the first to step into the ring, and threw his adversary among the ringing shouts of the multitude. He stepped back and declined to execute his victim who lay passive at his feet. As quick as thought, the chief of the Eries seized the tomahawk and

with a single blow scattered the brains of his vanquished warrior over the ground. His body was dragged out of the way and another champion of the Eries presented himself. He was as quickly thrown by his more skilful and powerful antagonist of the Iroquois party, and as quickly despatched by the infuriated chief of the Eries. A third met the same fate. The chief of the Iroquois seeing the terrible excitement which agitated the multitude, gave a signal to retreat. Every man obeyed, and in a moment they were out of sight. In two hours they arrived at Buffalo, gathered up the trophies of their victories and were on their way home.*

The visit of the hundred athletes of the Iroquois and its terrible results only served to inflame the jealousy of the Eries, and to convince them that they had powerful enemies to contend with. It was no part of their new policy to strengthen their power by cultivating friendly, or rather equal alliance, with any of their neighbors—they struggled to regain their ancient position as Arbitrators of the continent—the "Island"—as warriors, they must prove themselves "superior to all men." As a league, the Five Nations could not be dealt with, they must be destroyed in detail. With this view, a powerful war party was immediately organized to attack the Senecas. It happened at that time that there resided among the Eries a Seneca woman, who during the first war had been taken captive and been married to an Erie, he died and left her a widow without children, a stranger among strangers, and now sadly alone, her heart and thoughts naturally turned with longing towards her old home. Apprehending the terrible note of preparation for a bloody onslaught upon her kindred and friends, she formed the resolution of apprising them of their danger. As soon as night set in she started on her journey, travelled all night, and early next morning reached the "head of the lake," where she found a canoe fastened to a tree, she boldly jumped in and pushed out into the open lake. Coasting down the south shore of the lake she arrived at Oswego river in the

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*A parallel engagement between "Young Men" is found in sacred history, in II Samuel, Chap. II, Verses 14, 15, 16, beginning "Let the young men now arise and play before us." Let them arise." The place was called hereafter, the "Place of Strong Man." The chiefs arose and called out in a loud voice, "Treachery, Treachery."

night she was near to the town of Hon-ey-oye. She directed her way to the house of the head chief and gave him her information. She was immediately secreted by the chief, and runners were despatched to all the tribes summoning them to grand council. When they were convened, the chief arose, and in the most solemn manner, told the audience that a bird had appeared to him in a vision of the night, and that a great war party of the Eries was preparing to make a secret and sudden descent upon them to destroy them, that nothing could save them but an immediate rally of all the warriors of the Five Nations to meet the enemy before they had time to strike the meditated blow. These solemn announcements were heard in breathless silence. When the chief sat down there was one yell of menacing madness, and the earth fairly shook when the mass of frenzied Iroquois stamping the ground with fury, and brandishing high in the air war clubs, demanded to be led against the invaders. No time was to be lost, delay might prove fatal. A body of five thousand warriors was formed, with a corps of reserve of one thousand young men who had never seen battle. The bravest chiefs from all the tribes were put in command, spies sent out in search of the enemy, the whole body taking up a line of march in the direction from whence they expected an attack. Meanwhile, Erie scouts brought word to Buffalo of the approach of an armed force. Gegosasa, with over two thousand warriors besides women and children, took refuge within the palisaded fort or fortifications. This fortress, at present Buffalo, stood on a fine plain, and was surrounded by a high wall, formed of huge trunks of trees driven into the ground side by side, and wedged together. These were crossed within and without by smaller and longer pieces bound to them by bands made of split trees and wild vines. The whole was plastered with a kind of mortar, made of clay and straw stamped together, which filled every chink and crevice in the woodwork, so that it appeared as if smoothed with a trowel. Throughout its whole surface, the wall was pierced at the height of a man with loopholes, whence arrows might be discharged at any enemy, and at every fifty paces it was surmounted by a tower, capable of holding seven or eight fighting men. Whole villages were build of reeds and straw. These forts were built in quadrangle form and palisaded. The four sides were each four hundred paces in length from side to side, two other palisades divided it into separate

parts. As the Iroquois approached Te-osah-wa, two of the best chiefs disguised themselves in French military costume to frighten the Eries, and lead them to believe that the wonderful pale faces were with them. These advancing within hearing distance of the fort, advise the Eries to surrender. "The MASTER OF LIFE fights for us," said one of the disguised chiefs. "Who is this Master of Life of whom you speak?" replied Gegosasa. "We know of no Master save our right arms and our hatchets." The assault commenced, the palisades were attacked on all sides, the Iroquois using every exertion to carry the Fort by storm without success, their warriors being killed as fast as they approached. At length they resorted to stratagem, they converted their canoes into shields, and advancing under the protection thus afforded, they succeeded in reaching the foot of the entrenchment, using the canoes for ladders, they climed the palisades in face of the enemy, who, having exhausted their munitions, stood at last within their own fortifications "at bay" before the foe. Gegosasa, and one thousand of her warriors, disdaining to fly, and to afford, by a temporary resistance, time for as many as possible of her people to escape, now engaged in a terrible hand to hand and foot to foot engagement, the canoes gave passage way for continual reinforcements of Iroquois.

Intimidated by the boldness of the invaders, hundreds of the Eries fled. Gegosasa and her women were secretly led from the fort, guarded by the Queen's body guard. An indiscriminate slaughter of men, fleeing women and children now took place. The blood of the victims ran as water. The vanquished Queen and a remnant of three hundred fugitive Eries collected together and recruited their energies, they retraced their steps in hopes of surprising the enemy on his way home from the pursuit of their fleeing brethren. The plan was well conceived, but failed in execution, Gegosasa and her noble "three hundred" were surrounded, taken prisoners and led captives to Onandaga, the Queen to await trial for her act of betrayal of the Sacred Trust, as custodian of the National Pipe of peace. Her judges were chosen representatives from the Nations which at one time had ceased war at her command, and whose ambassadors had at her Council House at Kieuka, on the Niagara ridge, yielded their will to the utterances of a "Mother of Nations." The council fires of the Iroquois Confederacy accepted the judgment of the Onon-

dagas, the senate of the Nations, which was, that the Erie Confederacy should be wiped out of remembrance, and their name obliterated from the number of the tribes of the Huron-Iroquois race. The memory of such a dynasty as that of Yagowanea, "Mother of Nations" was to be buried fathoms deep in the waters bearing their name, the Sacred Lodge of Gegosasa demolished and the Order of Vestal Virgins dispersed, the towns of Refuge covered up or reduced to ashes. The confederacy of Neutrality, instituted in the days of "Antiquity" by the ceremonial of the Pipe of Peace, was left with no monument to carry their name save the name of the waters of Erie. The embarrassments of the wounded and so many captives had detained the Iroquois nearly two months in the country of the Neutrals. The Niagara Peninsula hereafter was annexed as "Hunting Grounds" to the territory of the Iroquoise. The rapids of Niagara which for ages have rushed through forest walls and rocky flats, haunted by the rattle-snake, are still hurrying with impetuous speed over rough and stony bed to yield their quota of "smoke" to the ever rising heavenward incense of Niagara "in memoriam" of the broken covenant of the "peace and good will towards men," which once ruled over the Council fires of Central Canaiderada.

The legend is told among the Chippawa tribe, that before Nature sleeps, she clothes herself in royal robes of purple, scarlet and gold in all the glorious mystery of the Indian summer. At that season (October) the Chippawa came to Niagara to make their annual sacrifice to "The Spirit," which dwelt behind the rocks. They chose a victim from the loveliest of their Vestals—the one chosen by lot was sent forth in a newly made white birch canoe, clothed in a tunic of swans' skins, over which fell as a mantle the glory of a woman, her long hair, ornamented with wreaths of flowers, around her neck were hung strings of white Wampum—the sign manual of her people that this particular maiden was the victim chosen by the tribe. From the Chippawa shore she was sped forth on the seething rapids above the Falls, an offering to the Mighty Being, who also would draw to himself over the cataract, twelve for the one withheld, before as many moons should wax and wane. One autumn, the lot of sacrifice fell upon an aged sachem's only child, the sole comfort of his old age. He opened not his mouth, and was dumb under the doom of the choice, but to live without her he could not. When she was far out

on the seething treacherous waters, the canoe of the unhappy father shot like an arrow from the bank to join with his child in death. Thus father and daughter met again at the moment the terrible "smoking" caldron below arched over with innumerable irridescent rainbows claimed the double sacrifice.

"Ye say they all have passed away,
That noble race and brave,
That their light canoes have vanished
From off the crested wave.
That 'mid the forest where they roved,
There rings no hunter's song shout
But their name is on our waters,
And ye cannot wash it out."

NATURAL HISTORY NOTES.

Read before the Hamilton Scientific Association Oct. 3rd, 1899.

BY WM YATES, ESQ.

An autumnal outing to South Norfolk county in company with Mr. James Goldie, senior, of Guelph, about a week ago, gave rise to several incidents of seeming interest. The main incentive to the trip was the procuring, if possible, of some specimens of that rather showy, wilding litospermum hertum, which, at the height of the floral season in mid-June profusely embellishes many of the sand knolls that frequently dot the landscape as one passes along the concession roads or crossing roads, in the township of Charlotteville and in other localities of that botanically interesting district. A search over several of those "braes" at the time hinted of at the beginning of this paper, discloses the fact that the plants in question had matured their seed and that the rather rough akenes had allen to the ground; yet abundance of the bristle adorned leaves remained (unwithered), to make the plants easy for identification, and a dozen or more well rooted specimens were dug up by Mr. Goldie, to be reset among the floral curiosities of his extensive garden.

A similar removal (and in the same locality) was our next proceeding with ten or twelve specimens of the hoary wild pea, *tephrosia virginiana*. This, when in flower, is a pretty wilding and has entirely overrun many exhausted sandy fields. The roots of the tephrosia are interlacing and deeply penetrate the subsoil, this trait being a great vexation to the ploughman. The tephrosia is spreading extensively in those districts congenial to its growth and its, vetch or pulse-like, seeds are carried by rodents like the chipmunk and red squirrel and by mice, and get extensive distribution by these and the similar agencies of birds.

It was noticed during the course of our woodland perambulations that much of the forest garniture of the *viola pedata* had been denuded by the severe drought of the season, as well as perhaps by

grasshoppers; yet about twenty well rooted specimens were removed to where they may not be so likely to "blush unseen" or to "waste their sweetness on the desert air." Another interesting shrub that was noticed, and seven or eight of its samples appropriated, was the *potentilla fruticosa*. About an acre of boggy pasture land was overrun by this rather rare shrub. Situate by the roadside, less than a quarter of a mile eastward from the picturesque village of Vittoria, this potentilla might easily be mistaken for one of the numerous species of St. John'swort, although the foliage of the former has a greater resemblance to some of the heathworts and has a very neat appearance but is pinnate (five to seven foliate) and clustered near the flower cymes. The tephrosias, too, are exceedingly handsome when in flower, with their yellow and red blossoms, the banners spreading and the stamens mostly in two sets, or brotherhoods, and seventeen to twenty-nine leaflets, hoary on the underside. We saw some patches of these flowers, an acre or two in extent, on waste land and the herb has rather a rank, unpleasant odour which protects it from being depastured by the groups of wandering bovines, which in the summer time are often allowed to wander to seek their subsistance by the roadside in the townships bordering on Lake Erie.

One of the farmers, who is a landholder, near the north shore of Lake Erie, told us that on the break up of winter, and as soon as the winter wheat fields are bare of snow, large numbers of wild geese alight on the green surface to nibble of the tender young wheat plants, and unless driven off by being fired at and chased, by gunners and riflemen, do much damage to the prospective crop, but as soon as the ice accumulations on the reedy and sedgy margin of the bays and inlets have melted and disappeared, the anserine visits to the wheat fields cease.

The farmer on whose land we dug up the lithospermums told us that a flock of forty or fifty wild pigeons came this fall to feed on his wheat stubble, and that they still live in the neighboring woods (this being a beedhnut year).

Dec. 4th, 1899.

What a remarkably fine autumn we have experienced. Blossoming dandelions abundant in the roadside grass up to the present date. Farmers about here are, some of them, working with team

afield to-day, although this morning there was about an inch of snow-fall which has nearly melted away, and batrachians have been hopping about among the fallen leaves in the woods and marshes within a day or two of late. We have only the regular winter bird residents to visit our shrubberies now, and the almost universal practice about here now is to cut up the corn fodder and pack the same in silos just as soon as ripe in early September, so the fields are clear of corn stooks, and in consequence few or no crows are seen or heard during the fall or winter season. Blue jays also keep more to the woods for acorns, etc., but frequent orchards too to regale on frozen and neglected specimens of apples and other fruit.

The long continued dry weather of the summer of 1899 has caused a great number of wells to fail to yield their normal supply so that the digging of new wells or else deepening the old ones has been in many instances resorted to in this district, and a more extended knowledge of the earth's surface-strata has been thus acquired. In these parts most commonly there are 4 to 6 feet of alluvium to be dug through ere the indurated or glacial clay layers are arrived at. These compressed and hardened deposits are found to extend to varying depths of from 20 to 40 feet or more, and to penetrate them, well sharpened mattocks or steel-pointed crowbars are a necessity, and the labor is sometimes nearly as severe as if logs of solid wood had to be pierced through. There are also numerous boulders of various species of rocks imbedded in the grayish or bluish clay beds, and occasional veins of thin layers of rather fine gravel are found at varying depths; and these, at a depth of 20 feet or more, usually yield a more or less copious supply of pure water, but generally the most abundant and permanent water supply is met with when strata of quicksand of greater thickness than the above mentioned are met with.

Gravel veins or streaks are met with. Violent currents or watery tides must have existed here at the time of deposition of these superficial strata, as is evident in some spots from the contorted and undulated, and sometimes variously inclined or inverted position of the earthy masses. Judging from the varying depths at which the loose sand strata or percolating gravel veins are met with there would seem to occur a sort of "pockets" that have been filled in with the indurated clay or marl, and when such sites happen to be struck by

the well digger his efforts to obtain a copious water supply are frustrated; yet on fresh attempts with the same objects, at a few feet or yards distance from the scene of baffled labors, water bearing strata are met with much nearer to the earth surface. These facts are frequently made profitable use of by pretenders, or else experts, in the mysterious uses of the witch-hazel branches or so-called divining-rod.

In the alluvial or loamy superficial strata too, boulders of varying shapes and sizes are of frequent occurrence, even in thoroughly well cultivated districts, and the queries as to "the when and the how" of their arrival in their present "site" frequently arises in the minds of these whose interest is found in the removal of these time resisting masses to places where they may prove less hindersome, or perhaps of high utility, in the hands of the stone-mason artizan. These boulders vary as much perhaps in their chemical composition and graining as they do in shape and size or volume,—a medley of granite, gneisis, slaty-limestone and innumerable softer species of rock, with, at times, a superficial loose stratum consisting of unworn fragments of rock, containing fossil impressions, called "drift" mixed with rounded gravel and loam or sand. Workmen engaged in the digging out and removal of these boulders notice that the "big end" or heaviest end of them is usually undermost in the earthy matrix and that not infrequently specimens are met with a few feet or a few yards apart whose surfaces indicate that the two have once been united, as a fractured side has notches and ledges that fit in and seem to form a counterpart to answering unevenness in a contiguous fragment. We remember a member of our family, who on one occasion was busy disinterring one of these alluvial boulders of a rather unusual magnitude, and on being approached by a chance passer-by who at once noticed that the big seeming rock had a separating chasm of the width of 3 or 4 feet, compactly filled in with hard soil, asked his opinion as to the agency or power that must have caused the disruption and separation, he promptly gave the conjecture: "Why, lightning, one would think," having evidently not a vestige of a doubt that the two divorced objects had once been in unity. These common experiences give cogency to the surmises of geologists as to a flooded condition of the earth's surface on the

thawing and dissolving of glaciers which are supposed to have existed in the frigid epoch of the terrestrial development.

About 6 weeks ago several children returning from school in the evening spoke of having watched on the grassy lawn an assemblage of insects that one of the scholars termed "dancing flies."

Sometimes as many as eight or ten groups of these gyrating gnats are to be seen in the limits of a half acre field on a calm afternoon but more frequently in the autumnal season than at any other time of the year. The harmonious, gentle, rhythmical movements of the coterie it is impossible to look at without interest and wonder.

Each gnat moves in an orbit of a certain form ; a sort of elongated ellipse. There are hundreds of individuals or more in each coterie or fraternity, evidently inspired by a communistic aim ; as in the dance of the (so called) superstitious "Shakers." Like humanity the gnat activities for the occasion tend to one corporate aim and like the orbits of the asteroids there seems to be a common centre or focus and the original point of departure (disruption) is returned to. There is in all the mazy movement no real erraticism, but an evident pre-determined ideal, as in the spider's geometric web. The music, too fine for most human ears, but like the hum of the mosquito capable of expressing extremes of sentiment or emotion, is a low hum of vibratory wings, as the assemblage rises to its apogee or perigee, one or two feet, then simultaneously (like a swarm of bees) drops to the lower level or segment of the orbitual curve and thence gracefully ascends to the appointed altitude of the living garland.

How so frail an atom of life is perpetuated in spite of extremes of solar heat and wintry blizzards seems miraculous, yet their permanence and capacity for enjoyment is evidently as well assured as the elements, as the rocks and woods and running waters. These gyrating gnats seem to find food, shelter and protection (like the aphides) on the under mildewed surfaces of grass and wet leaves about fences, or under the shade of groves, and like their relative the mosquito it is likely that water puddles and marshy areas are their essentials for reproduction ; although another cousin (i. e. the wheat midge) is independent of the aqueous elements as a nidus for its larvae and finds a nidus in the delicate germs of wheat blossoms.

The destructive Hessian fly, too, appears to be a relative of the

tipulæ yet its larva destructively thrives and luxuriates in the hollow stems of the most valuable of our gramineæ.

The weather has, on the whole been mild for December and the two inches of snow seems melting away. A walk in our woods just at present seems a rather tame affair. Many youngsters roam through the forest with guns shooting at bird or quadruped or any wild creature that comes in range. This causes the victims' tribes to retire to the most difficult and inaccessible parts of the bush, such as cedar swamps and boggy thickets, where berries and similar food yet abound. The ilex verticillata bushes were loaded with crimson berries until a few days ago; now the frosts have caused many of the rich looking berries to fall to the ground, but a few of the hawthorn trees still have a showering of fruit and the hips of the wild swamp rose are abundant and are made more juicy and bird-temptiug by frost. The ilex (or prinos) verticillata is deciduous, but were the leaves, as also the crimson berries, more persistent this shrub would be one of the most interesting of Canadian shrubs.

NATURAL HISTORY NOTES.

Read before the Hamilton Scientific Association, Feb. 21st, 1900.

BY WM. YATES, ESQ.

We have had some very cold nights of late, frequently 5 or 6 below zero, but winter is gliding by. One day this month I think the 8th or 9th the thermometer showed 54 degrees and many hive bees came out of their winter quarters and numbers of the hymenopterous honey gatherers got death chills by alighting on snow patches on the ground near the hives.

One of my neighbors says he lately found a bee tree in the wild woods; the snow tracks at the foot of the tree showed that the bee stores were being stolen by red squirrels as there were pieces of broken comb fallen about the tree base. There was a crack in the tree bole gnawed for enlargement by the squirrels.

True to the record the horned larks returned here on the first February thaw, after an absence of three months or more. They are now to be seen (and heard) on the highways and margins of stubble fields, enlivening the scene in groups of eight or nine, showing, as Emerson writes:

> "Far reaching concords of astronomy,
> Felt in the plants and in the punctual birds."

One of my neighbors says he has been lately petting a hairy woodpecker—P. Villosus. It lives in the hollow stem of an old apple tree near to his house. He hangs on the tree a piece of beef bone with some of the fat meat left on.

The bird, he says, comes out of retirement once in two or three days and gorges itself on the food store, goes back into the vegeative dark cave of Adullam, and is seen outside no more until hunger compels or suggests another outcoming.

Many blue jays come about almost daily to eat the seeds of frozen apples left in a few instances scattered on the leafless branches. Mr F. Bowles, a New England naturalist, says (and it is true) that

one of this bird's most common notes sounds like the syllables "roly-oly" three or four times repeated in momentary intervals.

The snow bunting appears to be more of a denizen of semi-barren moor land and of level plains and fields where weedy leas and waste margins of tillage at the boundaries of stubble are of not infrequent occurrence. The flocks of this species of bird have, we think, been more numerous this winter than usual, i. e. a greater number of small flocks, say of from fifty to eighty birds instead of the occasional large flocks of a thousand or more, and it is noticeble that the flocks in their restless journeying movements, avoid extensive wooded areas; their food being found in the dried capsules of the tall weeds that tillers of the soil are unable utterly to exterminate, and whose cymes and panicles and umbels the wintery snows hardly ever entirely submerge. The fact of the snow buntings being usually quite fat all through the season when they are met with here would seem to attest the abundance and rich quality of the customary food. Their frequent and chirrupy calls to each other as the straggling groups move forward from clearing to clearing, and the hurried flight which the few chance loiterers evince, in order to join the main body of their congeners, demonstrates the strength of the socialistic tie, and that they love to continue in sight and hearing of each other. The same communism is seen in their roosting or bivouacing habits, the flock huddling together at nights under the eaves or in the recesses of a straw stack or on the ground in the thick shelter of low bushes of evergreens. The sparrows and grackles have also the same instinct of close association during the hours of darkness.

The recent capture of a lynx in an extensive cedar swamp a few miles from here brought to notice the question of the origin of these ferocious and somewhat overgrown editions of felinæ and the probability of their being merely expanded instances of the domestic cat. There are many instances on record where house cats have been driven forth from the settlers' household, and of these outlaws having grown, during their wild predatory life, to a size much greater than that of the tame cat.

One such instance is remembered in this neighborhood where a certain grey grimalkin attained gigantic proportions, and rambled about the woodland neighborhood a terror to the majority of "stay-

at-home" felines. This bush ranger frequently visited poultry coops during the night in the role of an egg-stealer, and also had a habit of killing kittens in the maternal nests, and fiercely overpowering the said kittens' natural defenders. In an instance that was well attested, one of these tramp felines visited a dog kennel wherein were a litter of puppies with yet unopened eyes and in wantonness slew the whole of them!

The striped marking on some grey household cats are about as well defined as are those on Mr. Lynx, and the white or black spots on the end of the tail is no indication of a generic difference, as the same occurs at times in house cats. Then the tree climbing habit, being much extended in pursuit of bird or squirrel prey, and necessarily increased activity in habits and food hunting instincts, must tend to an increase of bodily size and muscular development.

The fact, too, of the common minx having usually a small white spot on its body, and the peculiarity of the situation of the said white mark being usually near the base of the lower jaw where it is most likely to escape observation, gives a wide field for conjecture as to the wherefore and design of such symbolism. This small spark of albinism brings to mind a story that was very current in these parts four or five years ago, that some boys in an adjoining township had captured a family of young white racoons, four in number. To what prenatal influence could such extraordinary phenomena be attributed? The word "freak" seems unsatisfactory and not quite conclusive, though there is an instance near here of albinism having seemingly become hereditary in poultry, for one of our acquaintances possesses a flock of white guinea fowl which are prized and admired on account of that eccentric trait.

Some time ago the writer of this was asked to give an opinion as to the agencies of production of a peculiar boulder or agglomeration of fragments of rock found near the surface of a neighboring field by the operation of the plough. The object is about the size of a bushel measure and would probably weigh 160 pounds. There is a mass of various fragments of rock cemented in a firmly cohering mass, as if angular pieces of rock of varying size and geologic age and structure had been held in a frame, mould or crevice promiscuously, and then a semi-fluid geologic "porridge," evidently

not in a state of fusion but aqueous, had under pressure perhaps, been forced all through the mass, leaving no interstices.

The effect produced is as if an unsymmetrical piece of encrinal limestone had been smeared with a thick coat of adhesive mortar and then rolled over a layer of broken stone or gravel, some pieces angular, some rounded at the corners, some pieces of quartz, some gneiss or granite, others Trenton limestone drift, cohering in a mass as if brown cement in a condition like "batter" had hardened about the mass.

Some apprehensions are beginning to be expressed as to the too reckless process of deforestation that is now going on. When the woods go many birds will go also. This assertion is even now being made plain.

The chicadees, like the European robin, sometimes come about farm dwellings to obtain food, bnt they show great fear of the shrike destroyer that is increasing in numbers and makes prey on many small species of birds. The chicadees come to our neighbors' kitchen doors now every day in parties of three, four or five, for crumbs and small pickings of food.

APRIL 4th, 1900.

Despite of the frosty nights and cold blustering winds of the daytime our red-breasted feathered acquaintances, the robins, were heard in our orchard trees singing their blithe notes just after sunrise on the morning of the 21st March, and on the day following, when the weather had become somewhat warmer. Blue-birds were present in the wood margin in considerable numbers, and made the leafless groves musical wherever there happened to be a sheltered or sunny exposure. The food of these early arriving birds seems to be principally the gray or brown moth that hybernates in the crevices and under the surfaces of the scaling off strips of bark of the sugar-maple and of the elm or other large forest trees. A few hours of sunshine about the beginning of March, or even at the ending of February, tempts these lepidoptera forth from their winter retreats, and often at that period of the year the gatherers of maple sap find numbers of the moths drowned in the sap of the receiving pails, as the weak saccharine aroma of the dripping fluid seems to possess a

dangerous fascination to various insects, such as the smaller moths and two-winged flies as well as to the species of wild bees, etc., and the blue-birds are occasionally seen to dart into the fluid sap contained in the brimming pails when chasing the moths or to seize the latter, as a tasty food morsel, as the insect in a half drowned condition struggles and flutters in its dangerous bath. But should a protracted cold spell occur, as sometimes happens late in April, the insect tribes stay in their retreats, and numbers of the robins die of hunger, and are found in an emaciated state under the barn floors or in open hay sheds. Usually of late years the moths (that are mostly the imago of the tent caterpillar) and are so numerous and ubiquitous in the forests and orchards that various species of birds obtain an abundance of food before vegetation has made any progress visible to the eye.

The phoebe flycatcher, too, is an early arrival, and has been noticed in the sugar bushes for the past ten days, and frequents the outbuildings about barns in quest of spiders and their ova, which are abundant about the rafters and interior frame timbers of the cattle byers and similar structures.

The song sparrows' refrain too is heard at as early a date as the note of the blue-bird. A few of these grass finches were heard and seen early as the 23rd March, and we suspect a few have stayed near dwellings about here during the whole of the past winter, finding food and shelter about the long grass, well protected by the low branches of evergreen trees and shrubs that grow about the farmers' homes.

The kill-deer-plovers come around as soon as there are pools of water in the depressions of the fields, the result of the first decided thaw, and the cries of these birds are now daily heard, and the occasional refrain of the meadow lark also. Those engaged in the manufacture of maple syrup say that a few grackles have been seen.

The indications are that the spring will be a late one. It is quite cold and March like to-day, and there has been but a very scanty run of maple sap so far. My son tells me that he heard the first faint piping of frogs in the swamp to-day (April 4th, 1900), and there is much ice and the remains of snow drifts in shaded parts of the woods yet, and there seems to be no likelihood of spring flowers for at least a week to come.

ANNUAL REPORT

OF THE

GEOLOGICAL SECTION

OF THE

HAMILTON ASSOCIATION

For the term ending May, 1900.

HAMILTON, Ont., May, 1900.

The section has much pleasure in submitting this its annual report, satisfied that substantial progress has been made in the collection of fossil specimens, and also that a greater knowledge of the field from which to collect fossil specimens has been acquired by those members of the Section who devoted their time to such work.

During the past year a large number of specimens have been added to the museum by Col. C. C. Grant, Mr. J. Schuler and Mr. H. T. Bartlett. Some of the species are new to the collectors of this locality. Numbers of these newly discovered species have been sent to experts for identification.

Special mention should be made of the discovery by Col. C. C. Grant of two species of Septobolus because of their rarity; only three of this family having been described by the late Dr. James Hall, Geologist of New York State, as occurring in the lower silurian rocks in America. Some varieties of Septobolus have been found in the the Niagara chert beds near Hamilton, these beds form part of the middle silurian series of rocks.

During the autumn and winter months a rearrangement of the fossils in the cases was made with the object of having a fuller representation of the characteristic specimens more readily obtainable for the purposes of study by those who choose to avail themselves f the opportunity. Also with the view of economizing space so as

to make room for the constantly increasing number of fossils being added by the different collectors.

Col. C. C. Grant, the most indefatigible member of the Section, has spent nearly the whole time at his disposal during the past year collecting fossils and data as to the different horizons whence certain organic remains first appeared on their stage of existence.

Many of the duplicate forms of fossils have been sent to the principal museums of the world, notably the British Museum, Washington Museum, Dublin Museum, and others, including our own at Ottawa and Montreal. The recipients have expressed their great pleasure and thanks for these donations. The fossil sponges are subjects of great interest to the professors in science who visit the museums containing these specimens.

Our museum has been kept open to the public on Saturday afternoons during the past year, so that the student of science could have an opportunity for comparative study, and gather such information as would be helpful to him in his special or general study, whether he took up the Geological, Palaeontological, Mineralogical Archaeological, Botanical or Conchological branch, and the Section is pleased to be able to place this fact on record, that qnite a number availed themselves of the opportunity.

The Section had hoped that before submitting this annual report it could have been placed on record that more commodious quarters had been secured for the better display of our already large and overgrown collection. Also, that instead of a few members who evince an undying interest in such a good work as the Hamilton Association is promoting, that the citizens of Hamilton generally would have taken hold and given us such assistance as would gladden the heart of the most pessimistic member of the Association, and at the same time have added another important attraction to visitors to this beautiful city, viz., a public museum.

Papers of interest were read at four of the meetings of the Section, two on geological topics, and two on malacology. The latter dealt with a few of the families represented in the museum, and one of the papers alluded specially to the fresh water shell, such as are found in the lakes and rivers of North America. Comparison was drawn between the fossil and the living types.

Following are the dates of the meetings at which papers were read, and the subjects:

Dec. 29th, 1899, Palaeontological, Geographical and Topographical notes, by Col. C. C. Grant.

Feb. 23rd, 1900, Fossiliferous localities, by C. C. Grant.

March 30th, 1900, Malacology, by C. C. Grant.

April 27th, 1900, Malacology, by C. C. Grant.

All of which is respectfully submitted,

A. E. WALKER,
Chairman.

A. T. NEILL,
Secretary.

OPENING ADDRESS.

Geological Section for Session 1899-1900.

BY COL. C. C. GRANT.

Owing to the state of our President's health, who unfortunately is unable now to take an active part in each year's fossil collecting expeditions, as well as the other employments which prevent members of the section from adding many specimens to the museum cases, as the only idle member of the community available, the duty devolves on the writer of laying the result of what has recently been obtained before you. With regard to the field geology of the district, there is little to communicate. We are all aware of the slow elevation or depression of the Earth's crust which has taken place recently at various sea-coasts. It was only within the last quarter of the century that similar changes were pointed to as occurring in our lake regions now by Professors Gilbert, Spencer and others. In a paper by the former, the writer lately received, entitled "Recent Earth Movements in the Great Lake Region," he credits Mr. Stuntz, land surveyor of Wisconsin, with being the first to notice these oscillations in or about Lake Superior. But the Earth movement or tilting up of its crust referred to in Professor Gilbert's work, and which Dr. Spencer, F. G. S., asserts is even now going on, does not appear to be confined to that portion of the continent, and the writer recollects, that Dr. Bell, of the Canadian or Dominion Geological Survey, brought forward several years ago very strong proof that considerable changes had recently taken place in or about the Hudson Bay District; and perhaps some of the members may not have forgotten the writer also stated on his return from Anticosti, that he had ascertained the sea-bed was undoubtedly rising at the principal station there, "English Bay," and probably along the south shore of the island.

No more need be said regarding the more general movement, but the alleged disturbance or tilting of the northern shore of Lake Ontario brings the matter close to ourselves, and as in former years, when I stayed at Winona during the past summer, I paid particular attention to the lake level, noting minor changes at some points and considerable ones at others, and still entertaining the views expressed in a former paper, viz:—that Lake Ontario was certainly encroaching on the south shore. This was not perceptible on a first glance from that portion of the park where I was standing, but on looking and taking in a wider range along the lake westward (only a slight breeze was blowing at the time), I saw the water level was considerably higher than it was the previous year, in fact, one found it impossible to get along the shore dry-shod, where no difficulty was experienced at the same time last year in walking below the high bank. A little to the west between Winona and Hamilton, a farmer assured me the lake was encroaching on his land, and he lost at the rate of four feet, on an average, annually. At the park itself and to the east beyond it, a very slight change has been remarked in the lake level. Owing to an alteration in the current, the prevalence of winds in a particular direction, or other cause, the sand-bank at the margin is increasing and forming a barrier to the advance landward. A line of heavy boulders from the fields above, around which the gravel accumulates, may further retard the progress. A few placed by the writer by way of experiment, were not removed by shore ice in spring. He was informed, however, they would probably be taken away in boats for building purposes.

The Erie clay, capped by a slight covering of surface soil, is a stiff, greasy deposit, containing many polished and striated pebbles and boulders. In certain places it offers considerable resistance to wave action, but in hot, dry weather, the face exposed to the sun's influence, disintegrates more quickly than one may imagine. The frost penetrating above, aided by this weathering process, keeps the bank (20 feet in one field, as measured) quite perpendicular, It seems evident from this circumstance, hat while the water is sapping below, the weather-

ing does its own share of the work above. If the land proprietors along the margin foolishly permit outsiders to remove gravel, boulders, etc., as they are now doing, thereby assisting in the progress of the destruction of their own farms, they deserve to lose them. The writer was much pleased to find the following extract in a Canadian daily paper, because it proves the press has its eyes open to geological facts, viz :—

THE GREAT LAKES OF NORTH AMERICA.

"Recent observations prove that a large part of the region around the great lakes of North America is being raised or lowered in consequence of the action of the Earth's internal forces. Dr. J. W. Spencer has given reasons for believing that the land to the north is rising so as to make the waters encroach on the southern shores; and now Professor G. K. Gilbert has proved by a series of careful measurements, that the broad lake-bearing plain is being slowly tilted up in the north-east, and down in the south-west. In consequence of these changes, the water of Ontario is encroaching on its shores, the estimated rise at Hamilton being six inches per century." Now, we understand, we have quite a number of superior people in Ontario who are ready to assert that the statements of such well-known scientific men as Gilbert and Spencer are sheer nonsense, that it would be quite absurd to believe the solid continent is undergoing the changes indicated. You will usually find the individuals of this class are the least observant members of the community, whose vision hardly extends beyond their own shadows. The rainfall may vary annually, and some years may be productive of heavier snowfalls than others, it is said. This is well known. Admitting that it is so, it does not affect the tilting of the lake bottom, proved by actual measurement of the United States engineers. Mr. A. E. Walker informed the writer when he came to Hamilton, hardwood trees were growing at the Beach, where now they could not possibly exist, and we may add, the *Indian Ossuaries* (burial pits) there were found to be submerged on two occasions when visited in different years.

PALÆONTOLOGY, LAKE SHORE, WINONA.

Nearly five or six weeks the writer was engaged in collecting Cambro-Silurian and Niagara, etc., fossils, at Winona Park and Grimsby during the past summer. Although failing to obtain a particular specimen not in possession of the Dominion Geological survey office for Professor Whiteaves, a large number of other fossils rewarded research, including several not mentioned by the late Dr. H. A. Nicholson in his report on the "Palæontology of Ontario." Perhaps the best preserved ones occur in a reddish-brown flag, more readily opened under the hammer than other layers along the lake shore there. I never noticed this bed in *situ*, in Ontario or Anticosti; it is exceedingly fossiliferous, containing several shells which are common to the Trenton and Hudson River (Bala) beds as pointed out already. Here we have the usefulness of the term "Cambro-Silurian," of the English Geologist. "Drift fossils," without explanation, would be highly objectionable, for they may be of any age.

A considerable amount of the rock material along the lake shore has been derived from the "*Erie Clay*." The scratched and polished surface proves glacial markings precisely like some dozen slabs extracted from its base above the lake level. In some cases, when they yield to the hammer, (they seldom do so) you may find organic remains. Only the hardest and toughest portion of the rock-imbedded, could have resisted the glacial grinding in "the ice age." This may account for the difficulty one experiences in extracting fossils from the material on the lake shore at Winona. Although many specimens were obtained, only a few are new species, probably. As we do not possess the earlier works of the late Dr. Jas. Hall, and other United States palæontologists, for the necessary comparison (in the absence of the fossils themselves which they describe) there is much difficulty in determining them.

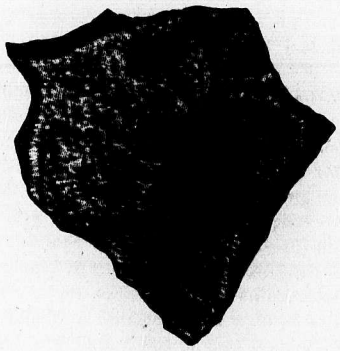
Some fine slabs, very fossiliferous, were collected for the Public Schools and private individuals who take some interest in organic remains, and since my return to the city some

twenty or more small parcels were forwarded to the Dominion Geological Survey Office, Ottawa. No fossils along the lake shore, to the east of Winona Park, attract the attention of even the casual visitor so much as the numerous Monticuliporoids. Some are unusually large for this class, as you may perceive from a few selected for an upper case in the Museum. Much difference of opinion still exists regarding their classification. The late Dr. H. Alleyne Nicholson states "their zoological affinities are yet doubtful. In many of their features they show marked relationship with the *Actinozoa* generally, and with the *Alcyonaria* particularly, while in others they approach the *Polyzoa*." On the other hand, Prof. G. B. Simpson, a well-known authority on this continent, places them with corals, thereby differing from Rominger and others. Although few new fossils were collected during the season along the lake shore, some rather rare ones were obtained. Perhaps the finest is a specimen ot *Cypricardites* (Cyrtodonta of the late Professor Billings). Until I compared it with the figure and the description I imagined it might prove to be the *Cyrtodonta Hindi*, named from its discoverer and found near Toronto, and which the palæontologist stated was the only one known to him. It does not apparently agree either with that or any member of the family from the Hudson River rocks of Anticosti, and probably may be considered a new species. Another interesting fossil of the drift may prove to be the *Conularea Gracilis*—Hall—of the United States Trenton beds. Without the original or its correct figure it would be unsafe to rely on a description at any time. For the same reason one may hesitate to name a Pleurotomaria, a Modiolopsis with a beak like *M. Nasuta*—Conrad (the latter was transmitted to Ottawa in one of twenty-two small parcels received since my return to Hamilton). Every year the hunting ground for drift fossils becomes more restricted, as buildings are erected in the city on the ancient lake beach or ridge which runs through Hamilton. Even the road at the Desjardins Canal is now closed, and the material for its repair is no longer required, which was formerly obtained from the overhanging cliff. A

visit to the locality recently proved to be merely a waste of time. In fact, nothing remains to a collector but the modern beach, lake shore, and perhaps the Slabtown gravel pit, if worked at present.

GRIMSBY QUARRIES.

The Niagara shales this season presented nothing new, and with the exception of *Stephanocrinus Augulatus*, no crinoids put in an appearance. The thin limestone layers, so rich in bryozoans, were few and far between, and only one rare specimen, *Eichwaldia*, rewarded a three days' search there for specimens. However, the upper green Clinton band furnished a considerable number of slabs containing remarkably well preserved examples of Dr. Jas. Hall's *Fucoid* (*Arthrophycus Harlani*), or a closely allied species, which may prove to be a variety of this singular sea plant.



THE CITY QUARRIES

furnished very few specimens during the past collecting season, although more than the usual quantity of road metal was removed, especially from the one at the head of "The Jolley Cut" known as "the corporation quarry." From a small portion of the Niagara shale not removed, Mr. Schuler, a recent member

of the Association, extracted what I believe to be a new sea plant. It certainly bears a very marked resemblance to the Clinton Graptolite (*Retiolites Venosus*), but the branchlets are more horizontal, longer and somewhat drooping at the extremities, not black, but the stained impression can be easily distinguished in the matrix. The discoverer of this interesting specimen presented it to the Museum. The writer, a little before this discovery, found in the same material which had been dumped into the Hancock quarry adjoining, the transverse section of the expanded portion of a very large segment of Professor Ulrich's Bryozoon *Sceptroporafacula*, which is now in the Redpath Museum, Montreal, together with a specimen of Schizotreta ovalis from the Niagara limestones of the same place. Both fossils appear to be unnoticed in Canada previously.

The Niagara Chert beds and limestones this season (*in situ*) were rather disappointing, but the old reliable field at the corporation drain made ample amends for this deficiency, as you may perceive, perhaps from the collection submitted for inspection which represents merely a portion of the specimens obtained from what we have named "The Glaciated Chert Beds." It may be necessary here to state the beds so-called represent about eight feet of the Niagaras at the brow of the escarpment near the city, which disappeared during "The Great Ice Age," but may be seem at the rock cutting on the railway a little beyond the resevoir. Eastward of the bluff which overhangs the Grand Trunk Railway (now closed to scientific research) you may notice a farm house with a young orchard. The field beyond the latter has for many years been a favorite hunting ground of mine for chert sponges and sections; in fact, it is where the late Dr. James Hall was informed by the writer we would probably find many specimens in the place I pointed out. However, as he seemed to be incredulous in the matter, and probably entertained doubts regarding his companion's sanity, it was considered necessary to explain the reason for this assertion with which he seemed satisfied. The two fields beyond were clear of brushwood and brought into cultivation within

the past few years ; the lumps of chert have had insufficient time as yet to weather, but a considerable number of the sections of sponges were obtained close to the outlet of the corporation drain. Not far from the Albion Mills there is a small patch of swampy land which afforded me some well-preserved flint-flake chert fossils.

Organic remains, Hamilton, not recorded as occurring here, obtained during season 1899.

Winona, *Cambro-Silurian* drift ;

Conularia gracilis.

Cyrtodonta, 2 species.

Monticulipora, species.

Medina, Hyatilla Congesta, Clinton crinoid (N. S., probably).

Niagaras and Chert beds : several new sponges and sections ; Certocephela—Warden ; Cornulites Clintoni ; Cornulites, 2 species ; Murchisonea (N. S., probably) ; Acidaspis ; Leptobolus, 2 species.

The only three of this family known were described as occurring in lower Silurians, by Hall. Their discovery in our local chert beds may be of interest to Palæontologists. Whether they are new species or varieties, in the absence of the described originals, cannot be determined. These I have not seen figured.

NOTE.—The list here given is incomplete. Other specimens, supposed to be *new species*, have been forwarded to experts for decision, and some fossils, rare with us but previously discovered in the United States, were obtained and sent to the Dominion Geological Survey office; Ottawa, as well as to the old country.

FOSSILIFEROUS LOCALITIES NEAR HAMILTON, ONT.

BY COL. C. C. GRANT.

A few days before starting for Winona Park last summer, I received a letter from Dr. Ami, Assistant Palæontologist of the Dominion Geological Survey, requesting information on the above subject, and in reply I stated that it would be furnished on my return to the city. I regret the matter quite escaped my recollection until recently, and although I believe what the doctor required would be found in scattered papers already published by our Association, we cannot expect officers of the Survey (overworked as they are) to wade through several years' proceedings to acquire such information. Now as members of the Section who recently joined are necessarily unacquainted also with localities previously indicated for organic remains, it may be advisable to collect for reference what was formerly written into a smaller compass despite a disinclination to repeat a story already told.

MEDINA SANDSTONE.

The quarries to the east of Hamilton, lying close under the Niagara escarpment have been nearly worked out. One, however, was reopened of late years at some distance, aud I have been informed there is reason to suppose the two near the city Reservoir which furnished me with Fucoids and other fossils formerly, would probably be again used for building purposes. If this can be relied on, a thin layer resting on a slight deposit of muddy shale lying between two sandstone beds of considerable thickness should be investigated. It contains plants, corals, gasteropods, brachiopods, etc. The upper surface of a massive grey band layer in an abandoned quarry near the city afforded me a Stromatopora, while the under surface of another a little beyond displayed the only *Orthoceras* noticed in the

"Medina series." A good many years ago a stone cutter pointed out to me a Favosites which his chisel revealed (to his intense disgust, as it ruined the slab intended for some ornamental purpose).

CLINTON ROCKS.

In order to get at the Medina sandstone, a considerable amount of Clinton shale overlying must be removed. This material after some exposure to the weather proved highly fossiliferous. Formerly the rubbish heaps extending from the foot of the Jolly Cut road to some distance beyond, were well known hunting grounds to the late Professor Wright, Mr. A. E. Walker, and the writer. Although much depends on the alleged re-opening of the sandstone (Medina quarries), more or less of the Clinton beds overlying are brought down annually by frost, heavy rains, etc., in minor landslips. During the past summer a Crinoid was obtained form this debris, in addition to a few fine lower Clinton slabs, containing Hall's Brachiopod *Lingula Oblata*, which occurs in one of the layers holding the well-known Fucoid *Buthotrephis Gracilis*, and varieties which may be looked upon yet as detached lower branches of the plant. Some few years previously the scattered plates of a starfish (derived from the iron band probably) put in an appearance in some shale which had fallen from an old quarry close to the eastern incline. The material near its foot (derived from Clinton beds, although insufficiently weathered) when examined during the past autumn displayed a few fossiliferous slabs.

The same may be said also of a rubbish heap, removed from a quarry recently re-opened for a short time close beside it. The peculiar marking on the edge of the flags, which indicated the presence of Fucoidal remains in the interior, requires close attention. This may be noticed at several points along the old quarries, and owing to the sloping banks of shale, one may easily reach these *in situ*, but their removal from thence, unfortunately, is no easy matter, as it entails much patience and hard work to displace the layers above them. When the upper reservoir above Judge Robertson's was constructed, by a

careful examination of the rocks removed, and the shale dumped on the slope near the Jolley Cut road, quite a large number of fossils were found. The iron band at this point, and lower Clinton green shales, presented several specimens not noticed at other similar horizons. The *Lingula Lingulata*, a Brachiopod, described and figured by the late Dr. Jas. Hall, from the former, was very numerous in a massive block which required to be broken up by the sledge. It appears to be confined to this particular place near the city. Three Graptolites occur in the shales below, which the writer has never noticed in the Clinton elsewhere. The Fucoids there are in rather poor preservation with one exception, in an instance where the plant was converted into iron. The specimen is now in the Redpath Museum, and pronounced a plant by the late Sir W. Dawson.

The upper green band (so rich in plant remains at Grimsby) contains merely a few ill-preserved *Lingulæ* at the Jolley Cut road, but fair specimens of *L. Clintoni* were to be had in the ravine below the Mountain View Hotel before the Incline Railway was placed there, and many organic remains, including the best preserved internal casts of *Pentamerus oblongus* yet discovered in the neighborhood of Hamilton. A quarry close to the hotel, not worked for some years for macadamizing material, afforded several Graptolites (*Dictyonemas* chiefly), bearing a greater resemblance to Quebec—lower silurian ones —than any seen in the city and adjoining quarries. One presented close bars connecting the branches at or rather near the base, gradually widening at the centre and becoming smaller towards the extremity of the branches, before it became embedded in the olden sea bottom. If only fragments of this single specimen were found, a palæontologist may well be mistaken for looking on them as representatives of distinct species.

I have been informed that the city will require a large quantity of stone as road material from the quarries at the head of the Jolley Cut road this year. Most probably the lower limestones, known in the States as the old Clintons (the best suited for the purpose), will be broken up for the crusher,

Our knowledge regarding the fossils contained in these massive building beds amount to very little, since an opportunity is rarely afforded of examining the interior. The Pentamerus bed at the base, which long ago attracted our attention here within the last few years, presented several fossils it was not credited with previously, and the limestone layers between it and the Stricklandinia beds, known to us hitherto as the barren Niagara limestones, have shewn they may now repudiate this misnomer, and if we can form an opinion from ill-preserved specimens we need not feel surprised at discovering a few more new specimens yet in addition to the ones which were recently found at the city quarry.

The Niagara shales here seldom display Graptolites worth taking; in general the muddy layers crumble away in which they are imbedded. This is the more to be regretted since we find them more perfect than many obtained from the overlying blue building beds or "chert."

The fossils in question are chiefly obtained in the upper or second layer of the former, the Glaciated beds of the latter, and the one known to us as the thick Graptolite chert bed. It is about six feet from the top at the brow of the escarpment when the surface soil, etc., is removed. Owing to the dip of the rocks here (about 25 feet in a mile) you must expect to find the horizon a little lower as the quarrying proceeds inwards. True, you may find an odd specimen at other levels besides the ones indicated, but they rarely put in an appearance. I was quite surprised to see two at the base of the chert recently. Both have been described already. The outlook for the collecting season of this year is very discouraging as regards the Medina sandstones and overlying Clinton rocks. Yet the Geological Section may be compensated for that by future discoveries, more especially in what we call the Glaciated chert Niagaras, rich in Graptolites, in Bryozoons and Hexactimelid Sponges, Brachiopods, etc.

The distant quarry at the head of the Jolley Cut has hitherto displayed very few fossils; that may be to a certain extent, owing to the chert beds there being much decayed. The Erie

clay is absent at the brow of the escarpment, the great protecing agent of the banks further inward. I believe a colony existed there of that rare Lingula, "*L. Ingerus Spencer.*" I succeeded in extracting one during the collecting season in good preservation and fractured two others. They were not seen *in situ*, but probably came from a middle layer in the Niagara chert. It is said the owner has lately permitted the corporation to use the upper beds for macadamizing purposes.

GLACIATED CHERT FOSSILS.

The writer secured an unusual number of sponges and various organic remains during the past season. Since his return from Winona several fields along the corporation drain had been ploughed up and planted with Indian corn, and in consequence of a long spell of dry weather the crops failed. Where not planted in rows, in some places, particularly near the drain and school-house on the Barton road a little beyond the Wentworth Hotel, the conditions were exceedingly favorable for collecting, although more weathered chert, flint-flakes, etc., appeared on the surface than was previously noticed. Perhaps not many new sponges or sections were discovered, but the ones we forwarded to the British Museum were in good preservation, and the same may be said of all specimens forwarded to England from this locality. The lands near the road at the top of the escarpment, a little beyond the city reservoir, were rather disappointing, although a few good sponge sections were obtained there. Some fields have been closely searched for years by fossil hunters, but in others the timber has only been lately removed, and insufficient time has elapsed for the weathering process to remove the outer covering which conceals the Spongidæ. The swampy part of a field not far from the outlet of the corporation drain, displays quite a number of flint-flakes, which hold very few fossils.

The Barton Niagara shales overlying the chert may be recognized in the rising ground a little to the west of the corporation drain. The ridge has been under grass for many years, but formerly held several sponges, corals, lingulidæ,

lamellabranchs, etc. When pointing out to a new member of the section, who lately joined our Association, places where fossils would be likely to reward research, my companion, Mr. Schuler, had the good fortune to secure a good specimen of "Uncimulus Striklandi" (Sowerby). Its occurrence in Ontario has not been noted by Schuchert or Nicholson, I think. Years ago the writer put in possession of the Dominion Geological Survey one which he supposed to be identical with *Rhynchonella Tennesseensis* (Roemer). The upper portion of the Barton series (lime ridge limestones in rear of the Mountain View Hotel) presented nothing new, and the Stromatopora corals are difficult to extract from the upper layer. The middle portion or water lime beds at or above the Albion Mills was visited only a few times during the past summer when no species unknown were obtainable. The writer believes the rock cutting on the T. H. & B. Railway, beyond Stoney Creek, has not yet been examined by our local geologists. The Niagara shale at Grimsby, where many Crinoids, Bryozoons and some Star Fishes occur. The upper Clintons there—rich in plant remains—the lake shore lower Silurian shingle and drift limestones between Winona and Grimsby are well calculated to attract the collector's attention.

A CYRTOCERAS FROM THE NIAGARA CHERT, HAMILTON.

The specimen recently obtained bears rather a close resemblance to a gigantic one found some years ago in the Barton bed above the Albion Mills, undescribed probably. It does not appear to agree with any fossil described or figured among the Niagaras of Hall or Nicholson. Although unusually large for a chert fossil, it may be only a dwarfed sample of the Barton Cyrtoceras referred to.

MALACOLOGY—CONCHIFERA.

BY COL. C. C. GRANT.

Read March 30, 1900.

It may be noticed that the writer in a former paper already published in our proceedings, omitted to refer to the Teredo, the very destructive ship worm, which at one time was looked upon as a univalve also.

The shell in question proves to be a true Conchifer, with the valves enclosed in a calcareous tube. It is said to have been introduced into Northern Seas from the Indian Ocean, but this statement seems very doubtful. We have reason to believe the eastern one, which is said to attain a length of two feet at times, may prove to be quite a distinct species, and it appears improbable that a Mollusc inhabiting tropical seas would increase to such an extent with uncongenial surroundings in the course of a few centuries. A shipping agent at Halifax, Nova Scotia, informed the writer that he had known an instance of a complete destruction of the hull of a sailing vessel in harbor, either there or at Quebec, in a few months after she was launched, by this sea pest. The *Gastrochena Aspergillum*, or watering pot shell, is also a Conchifer. A fine example may be noticed in Mrs. Carey's collection. Woodward separates the *Tubicolidæ*, of Lamark, from the *Pholadidæ* (it may be on insufficient grounds), and places the so-named ship-worm under the head of the latter. The Pholas or Pidack is used largely for fishing purposes on the Devonshire coast in the Old Country. The habit they possess of burrowing in stone and timber, as well as the phosphorescent light at an early period attracted the attention of conchologists. The shell is thin, and is said to be brittle. This may account for the provision made by nature to prevent extinction. In the early part of the century there was no little disputation regarding the means employed by the Mollusc to

penetrate into the place of habitation, some supposing a secreted acid was used for the purpose. A French naturalist at last solved the difficulty by proving the valves were adequate to pierce limestone, and a Brighton gentleman (Robertson) explained, from actual observations, how the common Pidack penetrated chalk rocks. Species are found fossilized in "the Lias," and also the Teredo, both in America and Europe, but neither rewarded the writer's researches during a rather hurried examination at Bath of the rocks in question many years ago. Little reliance may be placed on assertions of ordinary newspapers in matters relating to natural history, but we would feel inclined to believe there may be some truth in a statement to the effect that the Teredo had been discovered in Tertiary deposits in Europe also. There appears nothing extraordinary in this. The Pholas has been found embedded in amber, a production of that period.

THE SOLENIDÆ.

The Razor fishes, of world-wide distribution, gaping at both ends, likewise possess the property of concealing themselves, burrowing in sand, at or close to low water mark, nearly perpendicularly, and leaving a peculiar opening which reveals their position to people, who do not hesitate to fetch them to the surface by means of a stout piece of bent wire. By many they are looked upon as a great delicacy, the late Professor Forbes pronounced them to be excellent when cooked. It is fossilized in the Eocene "*Cutellus* (*Cerati Solen*) *legumen.*" A British species bears a near resemblance to "Orthodesma" paralellum, (Hall), so that Woodward considered the latter probably was a Cambro-Sil. Razor fish. An internal cast (both valves) obtained some years ago from the Slabtown gravel pit, led one to imagine the shell to be more nearly allied to the "*Modiola*" (Horse Mussel) —*Lamark.*

THE MYACIDÆ.

This group also has a habit of burrowing; one of the family (Myaarenarie), Woodward remarks, is found a foot deep in its faorite haunt, viz.: the mouths of rivers on the British

coast, together with "Myatruncata." The two species I saw in Anticosti, possess precisely the same habit. I regret I did not bring back with me a few of the living shells, but I secured a great number in a fossilized state from the blue "Leda Clay" of the island, and they agree exactly with the European shells. They first put in an appearance in the "Miocene," but the Corbula (basket shell) occurs as far down as the Mesozoic age. The writer received from the Smithsonian Institute a few years ago, the fossilized specimen of a *Panopea*, a Mya now in one of the small cases. The "*Panopea Australis*" at the Cape, buried in the sand at low water to a depth of several feet. "*Saxicava*" is found to be very destructive to the Plymouth breakwater. An English naturalist states: "It has been honeycombed by the Mollusc six or more inches deep." I obtained no living ones, I think, at Anticosti, but several in the Leda Clay. They range, Woodward says, from low water to 140 fathoms, and he adds, the British specimens (Panopea) have been caught accidentally by deep water fishing hooks. In Mrs. Carey's collection you may notice some fine specimens of the Cardiadæ, from the Californian coast. The Cockle of the Old Country "*Cardium Edule*," frequents sandy beaches. Numbers of women in Ireland are employed in collecting the heart-shell for market. It was, I believe, instrumental in saving many lives during the famine in the island along the sea-coast. Like the Razor shell when it burrows in the beach, it leaves a mark which betrays its habitation. This species has been found in the "Norwich Crag." Sub-genera have been recognized as far down as the upper Silurian age, and not long since, the writer sent to the survey office, Ottawa, a Conocardium from the Ontario Devonian Rocks, which bore a near resemblance to C. Alifoyme, (Sowerly), of the mountain limestone in the south of Ireland. The "*Aviculidæ*" or Wing-shells, to which the well-known pearl oysters belong, have attracted much attention from a very early age, (the so-called *Hammer Head Oyster* is also a member of this family). Ceylon and the Red Sea were formerly famous for their valuable pearl fisheries, but long since, travellers pointed out that unless steps were taken to preserve the Molluscs, the supply must assuredly

fail in a very few years, and this prediction has since been accomplished. Since the decline, fresh diving grounds have been discovered in North Australia and the Philippines. It is said an English company, of which Mr. Streeter, of London, is a member, employs quite a number of vessels in the business, and the mother-of-pearl shells are of more value than the gems they contain. A United States daily, the *St. Louis Democrat*, mention the company, in one year of the Australian fishery, netted (at $100.00 a ton) $400,000 for the former, and the value of the latter was estimated at about a third of this amount. Perhaps these figures are unreliable, and the syndicate may not care to publish the true state of its affairs. The pearls of the "*Sulus*" are said to be remarkable for their beautiful iridescence.

THE PINNA.

This thin wedge-shaped shell is remarkable for the beautiful silken bysus by which it attaches itself to the sea-bottom rocks, etc. While Woodward places it with the above family group, Ward holds it entitled to family distinction as Pinnidæ, stating, "Unlike the *Aviculidæ*, the species of this genus have been steadily increasing in numbers since Geological times." We may think this circumstance insufficient for the change, however. The silken byssus is made into gloves, and used for various ornamental purposes by the natives of Italy and the countries to the north of the Mediterranean sea. The Aviculidæ are well represented from the lower Silurians upwards. The range is world-wide, and several are found fossilized in this neighborhood in good preservation. Among them we enumerate "Ambonychias," "Posidonomyas," "Posidonia." We have reason to believe the Pectens, or Scallops, which made their appearance in a more recent time, derived their descent from the Aviculidæ. McCoy named a Conchifer from the Carboniferous which bore as close a resemblance to the one as to the other *Aviculopecten*, and I have found Conrad in New York State calls a specimen he discovered there "Avicula pecteniformis," which amounts to "like a Pecten." The Scallop fishery of Ireland is of considerable importance. They are said

to move rapidly through the water by opening and shutting the valves, and have been known to spring sometimes a foot above water.

THE MUSSEL.

This Mollusc also moors itself by means of a byssus, like the Pinna. In the Old Country large quantities, it is stated, are consumed, especially in Scotland, in addition to the many thousands used in the fisheries. The type is not the dark blue species, the one we find at both sides of the Atlantic—*Mytilus edulis*—but the bright green one of its genus named by Chemnitz *Mytilus Samaragdinus* of the Indian seas. The Mussels at Anticosti are exceedingly numerous and unusually large. This no doubt, is owing to the fishermen not using them as bait or for other purposes. The writer brought merely a few of the living ones, but the specimens fossilized in the Leda Clay sent to the Redpath Museum, were rightly considered identical with the European species by Sir W. Dawson. We are unable to offer any satisfactory explanation regarding the change in the color of *Mytilus Edulis* from deep blue to mauve. Occasionally perhaps, it occurs only in dead shells and not in living ones.

The writer never noticed it in the latter, either in the Old Country or at Anticosti. Among the fine collection presented by Mrs. Beasley to the Museum, you may notice an example The change of color is not referred to as far as I know in any Conchological work, and the generally accepted view regarding Mollusc coloring, viz., decomposition of light, etc., can hardly be quite satisfactory, since recent expeditions revealed such unexpected results as deep sea dredging brought to light. However, the matter seems more in the line of the chemist than Conchologist or Palæontologist. The *Modiola* or Horse Mussel differs from *Mytilus* in being inflated anteriorly. Woodward states it is distinguished also by its habit of burrowing or spining a nest. I have frequently found the latter in rock cavities at Anticosti. It may be when young it drifted into a hole left by some other stone borer, but another member of the family, a sub-genera, *Lithodomas*, the *Date Shell* of South Europe, cer-

tainly by some means or other manages to burrow into limestone.

THE TELLINIDÆ.

The rich delicate coloring of this family of compressed shells has frequently called forth expressions of admiration. Among the best known on this continent is the Florida *Tellium Radiata*, the sun shell of the dealers, which we find represented in every collection we examine from the south. The Tellens have a very extensive range and bury themselves beneath the sandy bottom. It is said some members of the family have a partiality for estuaries, the mouths of rivers, etc. We may well believe this to be the case. When quartered with the Depot of the Bedfordshires (16th Foot) at Yonghal, County Cork, I was assured some handsome Tellens seen there came from the mouth of the Blackwater. The valves perhaps were not so highly colored as tropical ones, yet they were exceedingly rich. There can scarcely be a sufficient reason assigned for separating the wedge shells from the foregoing. Ward ranks the Donacinæ as a sub-family. Donax (Hecuba) Scortum, Ceylon, has not such a deep, well-pronounced color as others of the family the writer has seen. Fossil Tellens are found in Mesozoic rocks.

THE VENERIDÆ.

The type of this family was named *Venus Puerpura* by Linnæus, and came from the Philippines. The *Venus Mercenaria* of this continent produced the highly valued purple Wampum sometimes found here in Indian ossuaries and is erroneously called the *Clam* in Ontario. The *Venus* (*Cytherea*) *dione* West Indies is remarkable for the long spines proceeding from the posterior portion of the shell. The beautiful *Venus lamellosa* (*Lamark*) Australia, is not represented in our collection. These Molluscs have greatly increased since their appearance in the Mesozoic Age and attained their greatest development in this.

THE ARCADÆ.

These angular typical shells cannot well be mistaken by anyone who carefully examines the hinge line and notices

the numerous teeth, especially in old individuals ; yet the writer has known instances where orbicular forms, *Cuculæa Pectunculus* for example, were actually mistaken for a species of *Cardium*. The hinge lines widely differ as anyone may see. Upwards of 200 species in a fossilized state occur from the Silurian to recent times.

MALACOLOGY.

(Continued April 27, 1900.)

BY COL. C. C. GRANT.

TRIGONIDÆ.

The sole survivors of this ancient family are found in Australian waters. Some naturalists hold there are three distinct species dredged there, while others consider these are merely varieties, since the internal color of the shell (purple or golden) is hardly sufficient for such a distinction. Recent dredging proves a considerable difference may exist not previously suspected. Take for instance the *Cypræa Tigris* of Linnæus—a naturalist in the United States—obtained off the Japanese coast lately no less than fifteen tiger cowries with well-marked color varieties. They vary, he states, from very light cream body color, sparsely blotched with brownish black spots, to others which are clouded with velvety brown, like precious tortoise shell. Mere varieties are probably often mistaken for that ill-defined term "species," referred to in a paper by Mr. Moffat, which has already appeared in our proceedings.

The modern Trigonia appears to be an exceedingly active mollusc. Mr. Stutchbury mentions he placed one on the gunwale of his boat, which leaped overboard, clearing a ledge four inches high. Woodward states fossil specimens are found ranging from the Trias to the chalk, and are not discovered in Tertiary rock. Perhaps this may be owing to the imperfection of the record. He refers to Lyrodesma, of the Cambro-Silurian drift of our lake shore, Amphidesma and others, and concludes their generic character has yet to be discovered, and the epidermal layer of the recent shell, with its nucleated cells, is a beautiful object under the microscope.

THE UNIONIDÆ.

The river Mussels, or *Naids*, are found in all parts of the globe, but nowhere in such abundance as in North America. Owing to the absence of dredging here in bay and lake, we are almost unacquainted with the Fauna of Ontario waters. Messrs. Hanham and Leslie, members of our association, when residing in this city obtained some *Unios* and *Anodontas* which were cast ashore by storms or caught up by ice shoves, but such were not fair representatives of the *Naids* of this locality.

Recently Mr. Schuler, a member of our association, scooped up from his boat (passing over shallow mud-banks) several large *Unios*, which appear to differ from all the writer has seen here previously. These specimens are submitted for your inspection and comparison with a few received from the Smithsonian Institute, Washington, U. S. A. It does not appear to be generally known in Ontario that the famous British pearls were by no means an unimportant factor in inducing the Roman invasion of Great Britain. These highly prized gems were obtained from river Mussels, chiefly inhabiting mountain streams. It is said the Scotch pearl fishery continued until the close of the last century. The Irish one at an earlier period was of considerable importance, and in a paper received from Ireland, mention was made of a very large fine pearl recently discovered in a river Mussel in, I think, a Donegal stream.

It is reasonable to believe that many of the rocky streams of the Dominion must also hold large quantities of pearl-bearing Mussels. When quartered formerly in London, C. W., I noticed on a low bank near a ford on the Thames River quite a number of Unios which were brought there apparently by some animal from thence, and on removing a portion of a decayed Mollusc from one valve I noticed a small pink pearl corresponding in color with the interior of the many empty heavy shells around. Old thickened specimens furnish the gems in Europe, and are just as likely to furnish these on this continent. It may be unnecessary to state the *Anodonta* (commonly called Swan Mussels), while resembling the foregoing, are edentulous; and

a French naturalist (D'Orbigny) asserts he found the young of a species in the River Parana, singular to relate, attached by a byssus—a circumstance which can hardly have escaped the attention of evolutionists to-day.

Unios occur in Mesozoic rocks, as stated by Woodward.

THE CHAMIDÆ.

These Molluscs are better calculated to attract the Conchologist by their singularity than beauty. The uneven surface ridged and furnished with rows of spiney lamellæ is merely one of their peculiarities. Inhabiting tropical seas and found on coral reefs, it attaches itself by *either* valve. Woodward asserts if by the right, the dentition is reversed, the left having the single tooth. Independent of the general appearance the structure of the shell, consisting of three layers, is noticeable. The fossil *Diceras*, a sub-genera of the Chamidæ, has been found in the middle Oolite.

TRIDACNIDÆ—*(Clam Shells)*.

These deeply ribbed, equi-valve and ponderous shells seem to have put in an appearance quite recently, fossil species occurring in the Tertiaries of Egypt. The animal is attached by a "byssus" or "free," and when the weight and thickness of the shell are taken into consideration one finds it difficult to understand the necessity of its being furnished with the means of fixing itself by the byssus to reefs at all. The Tridacna Squamosa (the type of the family) is said to be sometimes *a yard and a half long*—perhaps the "Tridacna Gigas" was meant the "Hippopus Maculatus" or Bears-paw Clam—differs from the former in shape. This may be found almost in every collection. Various stages of growth may be noticed in Mrs. Carey's case. The "Tridacna Gigas," unrepresented here, is rather expen-

NOTE.—Fossil Unios have been found in Irish fresh water Devonian the equivalents of Hugh Millar's old red sandstone. Prof. Forbes named one found in Kilkenny, *Anodonta fukesii*. Woodward was unaware of this discovery, for he credits the Weald with the oldest fossil Unio. The late acting Palæontologist of the Irish survey, Prof. W. H. Bailey, F.L.S., F.C.S., forwarded the figure of the shell now submitted for your examination.

sive, the dealer's price averaging from $15 to $20, according to size, state of preservation, etc. So many men are now engaged in dredging that it may be reductions have been made recently which are unknown to me.

THE MACTRIDÆ.

The writer retains a clear recollection of the olden kneading trough used in the country districts in Ireland formerly (and it may be still) for the purpose of making the home-made bread for the family. The Lutraria, or otter shell of Lamark, so closely resembled it in shape, that one need not feel surprised that it may have suggested the name it bears. I think I am acquainted with only two members of the family, *Mactra Stultorum* and *Lutraria Oblonga*, both inhabitants of British waters, neither of which I recognize in the Museum collection here. Another specimen of shell found on the coast of New Orleans, named *Gnathodon Cuneatuse* by Gray, with a shell of considerable thickness for the size represented, I have not seen; perhaps they are not by any means an attractive class, and, although there are sixty or more species widely distributed—but a majority in the tropics—the dealers seldom have many for sale. They bury themselves a little below the surface in sand or mud. Lyell mentions a curious fact regarding the Gnathodon, viz:—The road from New Orleans to Point Chartrain, (six miles), is made of these shells, procured from the east-side of the lake where there is a mound of them a mile long, fifteen feet high, twenty to sixty feet wide, and in places about twenty feet above the lake level; banks of dead shells are found twenty miles inland. Mobile is built on one of these shell banks. A species has been found in the Miocene of the States, and thirty species of Mactia are known to occur in Mesozoic rocks, (Lias) and upwards. The marking called the pallial impression of a shell represents where the border of the mantle was situated, and when a sinus or bay is noticeable it proved the animal (Mollusc) possessed retractile syphons. A close relationship may be noticed in families now separated by Conchologists or dealers, by comparing the internal markings of various groups. The

evolution of the fossil, *American Brachiopoda*, has been already clearly and most convincingly shown by Dr. Beecher, Professor Schuchert, and others. We may expect the evolution of the Conchifers to naturally follow. The tendancy at present is to form new genera or species from what may prove to be mere varieties. You will find the pallial impression in the right valve of the Conchifer.

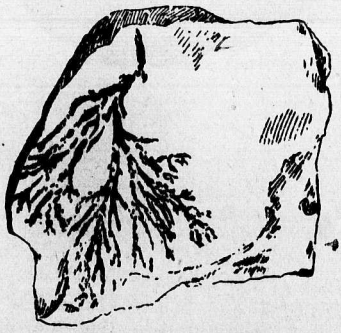
ANATINIDÆ.

The Anatina of Lamark, sometimes called the "Duck" or "Lantern Shell," has the muscular impression faint, thin, usually in equi-valve, possessing little beauty. It, or rather the sub-genera, has some interest in the eyes of the Palæontologist, since several fossil forms have been—rightly or wrongly—classed under the head from the Palæozoic (Devonian) upwards. It has been noticed while in the living Anatina the ligament is external, cartilage internal. In *Pholadomya*, etc., we have the external ligament only. This objection may be of little importance. It was supposed that one member of the family was a boring Mollusc (Thracia pubescens, Britain), but a closer investigation proved it only occupied the burrows made by others, or perhaps when young was accidentally conveyed into empty burrows of Saxicava. I already mentioned at Anticosti "Mytilus Edulis may be noticed (small specimens chiefly) concealed in similar crevices of limestone rocks.

In the foregoing the writer may have referred to a few shells not found in our collection here, and trusts he has not omitted any important family.

SOME RECENT LOCAL FOSSILS.

No. 1 represents a cornulites of the glaceated chert beds. It differs from "Coleolus Herzeri," the tube is slightly bent—the faint concentric lines are absent, and the surface quite plain.



No. 2 displays a beautiful Acanthograptus—single stalk, and differs from all others seen by the writer. It occurs in a glaceated upper chert bed, "Acanthograptus Bartonensis" would not be an inappropriate name if recognized as a new species.

No. 3 represents probably a new species of "Dendrograptus" from the Niagara beds, Hamilton. In the absence of the angular cell denticles of the group it is impossible to be positive on this point. It appears to proceed from a single stalk noticed in base of another specimen.

As the proceedings are not solely devoted to geological matters, a description would not be recognized. It is simply figured to attract the attention of members and others interested in Palæontology to a fine specimen lately obtained from local rocks.

C. C. GRANT.

A CURIOUS RELIC.

Somewhere in the sixties, before and immediately after the town of Hamilton took rank as a city, much laying out of streets, excavating and building took place, several very important archaeological spoils in consequence fell to the cities of Ottawa and Toronto. Fortunately all this has not been swallowed up in Provincial or Dominion museums. Thirty years ago, while men were digging a wall on south Wellington street premises, they found a "pit," not the usual "bone pit," but two sculptured bas relief heads of Niagara sandstone, one that of a woman, the other that of a man. The former is still to be seen embowered from the vulgar gaze in a quaint garden of fruit and flowers on the corner of Main street and Ferguson ave. Col. Grant, geologist, pronounces the stone to be Niagara sandstone, but does not believe the sculpture to be Iroquois but Mexican. Mr. Alison, of Waterdown, thinks the object the work of some more ancient people than the Iroquois—the Neutrals—as he has in his unique collection found about Medad many polished specimens of Niagara stone. It shows that the Neu-

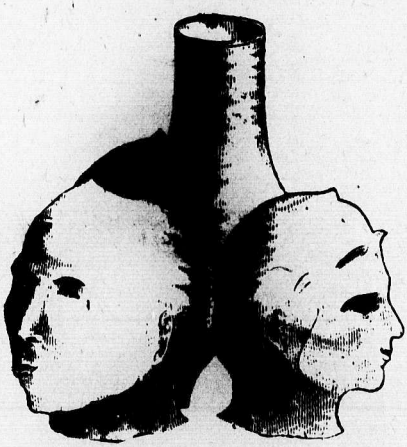


FIG. 1.

FIG. 2.

trals must have possessed some means of cutting and polishing stone in a superior manner to that of the later tribes. When these heads were discovered a number of tomahawks and axes were buried with them. It is said that these relics of a by-gone age were buried by the Iroquois. A curious opening is cut out on the back of the stone head, oblong, evidently as a hook to fasten the stone on a pole or beam.

Many of the archaeological relics found in American and Canadian museums relate back to a race of men and an age which have passed beyond the ken of modern Indian traditions. In support of Mr. Alison's theory is a remarkable representation of human heads, (Figs. 1 and 2), carved on a funeral base, called the *triune* cup, found in 1819 on a fork of the Cumberland River, Western N. Y. The object is thus described: "It consists of three heads joined together "at the back part, near the top, by a stem or handle, which rises "above the head about three inches. This stem is hollow, six "inches in circumference at the top, increasing in size as it descends." . . . .

Are these relics, found so far apart from one another, relics of the same age? Let some antiquarian answer.

J. ROSS HOLDEN.

DONATIONS TO THE HAMILTON ASSOCIATION MUSEUM, SESSION OF 1899 TO 1900.

A Fenian's bayonet and belt, picked up after the engagement at Ridgeway.

An old wooden plough of 1812, made by an early settler in the Township of Ancaster.

A pair of steel candle snuffers about the same age.

A portion of the Judge Logie's botanical collection.

A curious relic of an old cannon ball from a quarry on a farm south of the Hamilton Asylum, and probably used with many others, as in several quarries of the United States:

"The method pursued with the cannon balls is to start the block of stone away by a light blast, and then between the quarry face and the block several of the smaller solid shot, usually the four inch sort, are dropped down into the aperture. Two men with crowbars give the block a little shake, and the instant the block moves in the slightest manner forward the shot take up their 'purchase' on the space made, when the large cannon balls, some measuring 14 or 15 inches and weighing 200 or 300 pounds, are dropped into the top of the gap. Now, the slightest outward jar by levers on the big stone send these heavy cannon balls dropping downward of their own weight, until, with an easy forward motion, the cube goes over on its face.

"These shot do away with any driving; of necessity their great weight in proportion to their size forces them downward, and their form prevents any chance of backward setting of the block.

"These cannon balls are also used as rollers, as they take up and go over the inequalities of the quarry surface, and can be rolled in any direction without resetting, thus doing away with the old style wooden rollers.

"They are also used to smother heavy clearing out blasts. Heavy rope mats are thrown over the surface where the blast has been set,

and the cannon balls are thrown on the mats."—Boston Daily Globe.

Several specimens of cut nickel ore from the copper mines in the Sudbury district. One piece taken from a shaft 1,400 feet below the surface. This piece is of great value.

A collection of fresh water shells from the lakes and rivers of Canada.

A number of specimens of carborundum :

About eight or nine years ago a then unknown man sat pondering the possibilities of discovering or producing some substance more efficient than either emery or corundum for grinding wheels and for polishing purposes. He pondered to some purpose ; then turned to experiment. An iron bowl lined with carbon, filled with a mixture of coke and clay, was connected with a dynamo. The current was turned on. Intense heat with a violent chemical action resulted. When cool once more the little mass of what had been clay and coke was broken open and a very few hard crystals of a bright blue color were seen. It was the birth of *carborundum*, a mineral probably as much harder than emery as emery itself is harder than chalk.

Encouraged by the presence of the few crystals the man renewed the experimnt on a larger scale with equal success and a daily product of not less than a quarter of a pound of carborundum. The precious stuff when ground to a fine powder was greedily bought by lapidaries at $10 per pound. Even at this famine price it was more economical, as well as more efficient than emery ; just two drams—one-eighth of an ounce—being found sufficient for a day's use in valve grinding.

The size of furnaces for producing carborundum steadily grew till now at Niagara Falls, N. Y., each of ten furnaces can produce two tons per day. This establishment, although already found too small for the demand, is of immense proportions, and is managed—with the aid of a staff of experts—by the inventor, the man who pondered and acted, E. G. Acheson, a name become famous the world over.

Carborundum, as it comes from the furnace, is a brilliant and beautiful object, a glittering mass of pinnacles clustered together and variegated in hue. Purple, garnet, sapphire, ultramarine blue,

pea and bronze green are prominent in the tints; yet the commercial value of carborundum does not lie in its beauty, but, as we have hinted, in its wonderful hardness.

The museum has been kept open every Saturday afternoon as heretofore.

ALEX. GAVILLER,
Curator.

CAMERA SECTION

OF THE

HAMILTON ASSOCIATION.

Secretary's Report for the Season ending April, 1900.

HAMILTON, April 9th, 1900.

During the season the Section has had twenty regular meetings, with an average attendance of twelve.

At the beginning of the season it was decided by the Section not to join the American Lantern Slide Exchange, and that the efforts of the members be directed towards furthering the interests of the Canadian Exchange, and also in giving demonstrations for the benefit of the younger members.

Your Secretary, as directed, wrote all the Camera Clubs in the Dominion asking for their co-operation in the Canadian Lantern Slide Exchange. Two cities signified their approval of the scheme, namely, Galt and St. Thomas. Halifax and St. John Clubs were found to be defunct, while the Toronto and Ottawa Clubs did not have the common courtesy to make any reply. Under these circumstances the whole scheme had to be abandoned.

Several successful outings were held during the summer months, which were largely attended, and some very good work performed.

At the opening meeting of the Hamilton Association an exhibition of members work was held. Mr. A. H. Baker presented a medal for the best collection of photos, which was won by A. D. Souter. F. O. Eager was second and J. R. Heddle third. The Judges, Messrs. A. M. Cunningham and J. Gordon, made special reference to some of the work of other members, and stated that the exhibition on the whole was very creditable, and the tendency was along the right lines, viz., suppression of distracting detail for a broader aspect of Nature.

The enlarging lantern in the Dark Room has been refitted, and a new reflector added which reduces the time of exposure considerably, but a new lens should be procured for this instrument as soon as possible, the lens now in use being unsuitable for enlarging owing to its lack of sharpness.

Mr. Hugh Baker gave the members an exhibition of moving pictures at his residence, which was greatly appreciated by those who were present.

During the year the Section has been instrumental in having several additions made to the Photo Literature in the Public Library. A great deal might still be added with advantage to the members, and I hope to see this considerably augmented in the near future.

Mr. S. J. Ireland gave a lecture on Composition, which was probably the most instructive demonstration of the season. It is to be regretted that so few of the members attended to hear it. To every member who aspires to become a picture maker and not merely a maker of photos, this lecture was of incalculable value—for without a grasp of some of the rules of Composition it is only by the greatest fluke that a good picture can be made. If we had more lectures of this class the general quality of our work would increase considerably.

The Roll of Membership was revised and 26 name deleted, the membership at present being 65. I would like to note here that out of this membership only one-sixth attend our meetings. There must be a cause for this poor attendance, and the removal of this cause ought to be one of the first things attended to by the new Executive. This subject was brought up by some of the younger members, was discussed and finally laid on the shelf. It must not be allowed to lie there, or the very life of the Section will be endangered.

Some means whereby better accommodation, facilities for work, and social intercourse can be procured, is essential for the advancement of the Section, and the officers for the ensuing year will have to make this paramount over everything else.

The members have done better work this season than ever before. Three of our members having taken first prizes in outside competition.

Regarding the future work of the Club, I would like to throw out a suggestion. The Club has now on its hands a very large collection of slides, most of which are uninteresting owing to there being nothing to sustain the interest during the exhibition of any of the sets. If the Club would choose some poem, song or short story, let each member do his best to illustriate it, at the end of the season a committee might be appointed to select from the work done the best photos illustrative of the poem or song, from which a set of slides of lasting interest might be made. I believe that something along this line would tend to hold the interest of the members, cultivate the imagination, test the artistic capabilities and draw out the best talent in the Section. No doubt we would make many failures in working out such a scheme, but let us use them in true Tennysonian fashion, and "Rise on our dead selves to higher things."

In conclusion I would beg to thank the members for the honor which they conferred upon me in electing me Secretary of the Club, and to apologise for any shortcomings I may have been guilty of.

Respectfully submitted,

J. R. HEDDLE,
Secretary.

TREASURER'S STATEMENT TO MAY, 1900.

RECEIPTS.

Cash balance, 1899	$147 85
Government grant	400 00
Members subscriptions	114 00
Hamilton Horticultural Society, rent	3 50
Wentworth Historical Society, rent	6 00
	$671 35

DISBURSEMENTS.

Rent of museum	$138 00
Rent of dark room room photo section	12 00
Caretaker	44 50
Gas accounts	12 68
Printing	21 05
Journal of Proceedings	175 00
Postage and stationery	28 44
Grant to photo section	5 13
Sundry accounts	21 25
Balance on hand	213 30
	$671 35

P. L. SCKIVEN, *Treasurer.*

REPORT OF THE CORRESPONDING SECRETARY FOR THE SESSION OF 1899-1900.

To the Officers and Members of the Hamilton Association:

Your Corresponding Secretary for the year 1899-1900 begs leave to report that:

1. He has carried on the ordinary correspondence of the Association.

2. He has received and acknowledged the exchanges in accordance with the subjoined list of institutions and societies, and these various bodies have also been furnished with copies of our last annual "Journal and Proceedings."

THOMAS S. MORRIS.

LIST OF EXCHANGES.

I.—AMERICA.

(1) Canada.

Astronomical and Physical Society	Toronto.
Canadian Institute	Toronto.
Natural History Society of Toronto	Toronto.
Department of Agriculture	Toronto.
Library of the University	Toronto.
Public Library	Toronto.
Geological Survey of Canada	Ottawa.
Ottawa Field Naturalists' Club	Ottawa.
Ottawa Literary and Scientific Society	Ottawa.
Royal Society of Canada	Ottawa.
Department of Agriculture	Ottawa.
Entomological Society	London.
Kentville Naturalists' Club	Kentville, N. S.
Murchison Scientific Society	Belleville.
Natural History Society	Montreal.
Library of McGill University	Montreal.
Nova Scotia Institute of Natural Science	Halifax.
Literary and Historical Society of Quebec	Quebec.
L'Institut Canadien de Quebec	Quebec.
Natural History Society of New Brunswick	St. John.
Manitoba Historical and Scientific Society	Winnipeg.
Guelph Scientific Association	Guelph.
Queen's University	Kingston.
Niagara Historical Society	Niagara.

(2) United States.

Kansas Academy of Science	Topeka, Kan.
Kansas University Quarterly	Lawrence, Kan.
American Academy of Arts and Sciences	Boston, Mass.
Psyche	Cambridge, Mass.
Library of Oberlin College	Oberlin, Ohio.

American Association for Advancement of Science ..... Salem, Mass.
Museum of Comparative Zoology ..... Cambridge, Mass.
American Dialect Society ..... Cambridge, Mass.
United States Department of Agriculture ..... Washington, D. C.
Biological Society of Washington ..... Washington, D. C.
Philosophical Society of Washington ..... Washington, D. C.
Smithsonian Institution ..... Washington, D. C.
United States Geological Survey ..... Washington, D. C.
American Society of Microscopists ..... Buffalo, N. Y.
Buffalo Society of Natural Sciences ..... Buffalo, N. Y.
California Academy of Sciences ..... San Francisco, Cal.
California State Geological Society ..... San Francisco, Cal.
Santa Barbara Society of Natural History ..... San Francisco, Cal.
University of California ..... Berkley, Cal.
Minnesota Academy of Natural Sciences ..... Minneapolis, Minn.
Academy Natural Sciences ..... Philadelphia, Pa.
Academy of Sciences ..... St. Louis, Mo.
Missouri Botanical Gardens ..... St. Louis, Mo.
American Chemical Society ..... New York City.
New York Microscopical Society ..... New York City.
The Linnean Society ..... New York City.
American Astronomical Society ..... New York City.
American Geographical Society ..... New York City.
New York Academy of Science ..... New York City.
Terry Botanical Club ..... New York City.
Central Park Menagerie ..... New York City.
American Museum of Natural History ..... New York City.
Scientific Alliance ..... New York City.
Cornell Natural History Society ..... Ithaca, N. Y.
Johns Hopkins University ..... Baltimore, Md.
Kansas City Scientist ..... Kansas City, Mo.
Wisconsin Academy of Science, Arts and Letters ..... Madison, Wis.
Society of Alaskan Natural History and Ethnology ..... Sitka, Alaska.
University of Penn ..... Philadelphia, Pa.
Franklin Institute ..... Philadelphia, Pa.

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.
State Geologist ..... Albany, N. Y.
Rochester Academy of Sciences ..... Indianapolis, Ind.
Indiana Academy of Sciences ..... Indianapolis, Ind.
Davenport Academy of Natural Sciences ..... Davenport, Iowa.
Pasadena Academy of Sciences ..... Pasadena, Cal.

(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.

British Naturalists' Club ..... Bristol.
Literary and Philosophical Society of Leeds .... Leeds.
Conchological Society ..... Leeds.
Royal Society ..... London.
Royal Colonial Institute ..... London.
Society of Science, Literature and Art ..... London.
Geological Society ..... London.
Manchester Geological Society ..... Manchester.
Mining Association and Institute of Cornwall ... Camborne.
Cardiff Photographic Society ..... Cardiff.
Owens College, Conchological Society ..... Manchester.

Scotland.

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

Ireland.

Royal Irish Academy.....Dublin.
Royal Geological Society of Ireland.....Dublin.
Naturalists' Field Club.....Belfast.

(2) Austria-Hungary.

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

(3) Belgium.

Societe Geologique de Belgique.....Liege.

(4) Denmark.

Societe Royal des Antiquaires du Nord.....Copenhagen.

(5) France.

Academie Nationale des Sciences. Belles Lettres et Arts.....Bordeaux.
Academie Nationale des Sciences, Arts et Belles Lettres.....Caen.
Academie des Nationale Science, Art et Belles Lettres.....Dijon.
Societe Geologique du Nord.....Lille.
Societe Geologique du France .....Paris.

(6) Germany.

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

(7) Russia.

Comite Geologique .....St. Petersburg.
Russich-Kaiserliche Mineralogische Gesellschaft.....St. Petersburg.

III.—ASIA.

(1) India.

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

(2) Straits Settlements.

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 ..... Capetown.

V.—AUSTRALIA.

(1) Australia.

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

(2) New Zealand.

New Zealand Institute ..... Wellington.

(3) Tasmania.

Royal Society of Tasmania ..... Hobartown.

LIST OF MEMBERS

OF THE HAMILTON ASSOCIATION.

HONORARY.

1881 Grant, Lt.-Col. C. C., Hamilton.
1882 Macoun, John, H A., Ottawa.
1885 Fleming. Sanford, C. E , C. M. G , Ottawa.
1885 Farmer, William, C. E , New York.
1885 Small, H. B,. Ottawa.
1887 Charlton, Mrs. B. E., Hamilton.
1887 Dee, Robert. M. D.. New York.
1887 Keefer, Thomas C., C. E., Ottawa.
1890 Burgess, T. J. W., M. D , F. R. S. C. Montreal.
1891 Moffat, J. Alston, London.
1898 Carry, Mrs. S. E , Hamilton.
1899 Stratton, A. W., Ph. D., Lahoore, India.

CORRESPONDING.

1871 Seath, John, M. A., Toronto.
1881 Clark, Chas K., M. D., Kingston.
1881 Spencer, J. W., B. Sc., Ph. D , F. G. S., Savannah, Ga.
1882 Lawson, A. C., M. A , California.
1884 Bull, Rev. Geo. A., M. A., Niagara Falls South.
1885 Frood, T., Sudbury.
1889 Yates, Wm , Hatchley.
1889 Kennedy, Wm., Austin, Tex.
1891 Hanham, A. W., Quebec.
1891 Woolverton, L., M. A., Grimsby.

LIFE.

1885 Proudfoot, Hon. Wm., B. C., Toronto.

ORDINARY.

Alexander, A. F. S. Sc.
Adam, Jno.
Aitcheson, W. J.
Alton, Dr. W.
Aylett, Fred.
Appleton, L. G.
Ballard, W. H., M. A.
Ballard, John F.
Baby, W. A. D.
Baker, A. H.
Bale, F. J.
Baldwin, T. O.
Barton, Geo.
Beasley, Thos.
Beasley, Mrs. Thos.
Beckett, H.
Bertram, Jas. B.
Bicknell, H. H.
Birrell, Wm.
Black, Geo.
Briggs, Samuel.
Burkholder, J. G. Y.
Burns, J. M.
Charlton, B. E.
Campbell. D. J.
Campbell, Robt.
Clark, D., D. D. S.
Crawford, J. T., B. A.
Crawford, A.
Childs, W. A., M. A.
Clappison, Fred. P.
Coburn, H. P
Cochran, C. S.
Cummer, Albert
Cummings, S., M. D.
Davidson, Mrs. M.
Dickson, J. M.
Eastwood, John M.
Eager, F. O.
Easter, S.
Edwards, W. H.
Elliott, W. H., B. A.
Fearman, F. W.
Fearman, F. W.
Fearman, R. C.
Findlay, W. F.
Gadsby, J.
Gaviller, Alex.
Gaviller, E. A., M. D.
Garrrett, A.
Graham, C. O.
Grant, W. J.
Grant, A. R,
Greene, Joseph
Grossman, Julius
Hansel, Franklin, D. D. S.
Heddie, J. R.
Hemming, A. H. H., O. S. A.
Herriman, W. C., M. D.
Holcroft, C. J.
Hore, J. G.
Hoyle, Chas.
Husband, Geo.
Hunt, Fred.
Jones, C. J.
Lancefield, R. T.
Land, J. H.
Lee, Lyman, B. A.
Lees, Geo.
Lees, W. A.
Leaney, C. A.
Leggat, Matthew

Linger, Jesse
Logan, W. F.
Logan, W. McG., M. A.
Lottridge, Murray.
Marshall, Wm.
Magee, Frank.
Mills, Edwin
Millard, J. W.
Mitchell, W. M.
Morgan, S. A., B. A., D. Paed.
Moodie, J. R.
Moodie, Jas.
Moore, H. S.
Morris, Thos., S.
Mullin, Arch.
Mulvaney, W.
McIlwraith, Thos.
McInnes, Hon. Donald.
McLagan, Alex.
McLaren, Col. Hy.
McKenzie. Ian.
McKenzie, A M.
McPherson, F. F., B. A.
Neill, A. T.
Pothier, C. A.
Pottenger, John.
Patterson, P.
Powis, A.
Plant, Robt.
Randell, D.
Reynolds, T. W., M. D.
Roach, Geo.
Robertson, R. A.
Robinson, W. A.
Rutherford, Geo.
Schuler, J.
Scriven, P. L.
Sero, J. O. Brant.
Small, T. Chas.
Souter, D. A.
Slater, James.
Strathy, Stuart.
Strong, Ray.
Sweet, J. C.
Thompson, R. A., B. A.
Thompson, W. C
Tolton, Stewart.
Toye, Walter.
Trigge, H. H.
Tuckett, Geo. E.
Turnbull, A. C.
Turnbull, J. D.
Turnbull, W. C.
Turner, J. B., B. A.
Tyrrell, J. B., C. E.
Vernon, Elias, M. D.
Walker, A. E.
Wallace, W.
White, Wm.
White, J. T.
Wheatley, E. J.
Wilson, T.
Wilson, Wm.
Witton, H. B.
Witton, H. B., Jr., B. A.
Witton, W.
Wodell, J. E.
Young, J. M.