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JOURNAL AND PROCEEDINGS

OF THE

Hamilton Association

FOR SESSION 1892-93.

NUMBER IX.

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1893.

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ABSTRACT OF MINUTES

OF THE PROCEEDINGS OF THE

Hamilton Association

DURING THE

SESSION OF 1892-93.

THURSDAY, OCTOBER 13th, 1892.

SPECIAL MEETING.

The President, Mr. A. Alexander, in taking the chair, stated that it was not his intention to deliver an inaugural address, but would reserve it for some future occasion.

The custom adopted a year ago of inviting those interested in the work of the Association to attend the first meeting of the session was repeated, and there were present this evening nearly two hundred ladies and gentlemen. Biological, geological, botanical and photographic specimens were on exhibition; experiments in electricity were made; pneumatic and microscopic instruments were operated; and a musical programme was presented through the courtesy of Mr. J. E. P. Aldous, B.A.

During the evening the President explained the aims and work of the Association.

Seven applications for membership were received.

THURSDAY, OCTOBER 27th, 1892.

SPECIAL MEETING.

The President in the chair.

The Secretary reported the annual field day held at Grimsby.

W. McD. Logan, B. A., Stuart Livingston, LL. B., W. J. Sykes, B. A., Miss Kate G. Swanzy, C. J. McKinley, Miss F. L. Davis and Geo. Rutherford, were elected ordinary members.

Mr. W. Sanford Evans was then called upon to read the paper of the evening, entitled "The Possibilities of Fiction." The lecturer

urged that the underlying principles of fiction must be understood before a right criticism could be possible, and that the time had come when novels should be treated scientifically. Novels, it was claimed, were for more than mere pleasure, excitement and relaxation —they were a means of instruction through which to learn more of life. The work of fiction true to human nature preached in particular that which had been preached in general. The writings of George Eliot were considered by Mr Evans to be the nearest approach to the ideal he had formed. A discussion followed.

The President announced that no meeting of the Association would be held on November 10th, that date having been set apart as Thanksgiving Day.

THURSDAY, NOVEMBER 24th, 1892.

SPECIAL MEETING.

The President in the chair.

The Corresponding Secretary announced the receipt of a number of exchanges from learned societies.

The Curator reported donations to the Museum. Two applications for membership were received.

A paper on "The Zone Life of Ferns," contributed by Prof. Wright, Los Angeles, California, was read by the President. A discussion followed.

The Secretary then read the "Biological Notes" of Mr. Wm. Yates, of Hatchley, Ont. A discussion took place afterwards.

THURSDAY, DECEMBER 8th, 1892.

REGULAR MEETING.

The President in the chair.

The addition of a number of specimens to the Museum was announced.

A paper on "Southern California," contributed by the Rev. Wm. Ormiston, D. D., LL. D., Azusa, California, was then read by the Secretary. The paper dealt with the early history of the state, its products and resources. A discussion followed.

A second paper, "A Revised Spelling," was then read by Mr. James Ferres. The essayist dealt with the question of spelling

reform, giving numerous examples of anomalies in English orthography. Charts were exhibited by which it was shown that a revision of our spelling might readily be made. A discussion followed.

THURSDAY, DECEMBER 22nd, 1892.

SPECIAL MEETING.

Mr. A. T. Neill, Vice-President, in the chair.

After the transaction of business, Mr. H. B. Witton was called upon to read his paper on "Ballads, and Ballad Literature." The essayist dealt with the history and composition of the ballad, and gave a number of English and foreign selections. On the conclusion of the paper a discussion took place.

THURSDAY, JANUARY 12th, 1893.

REGULAR MEETING.

The President in the chair.

There being no other business, the President read a paper on "The Flora of the Niagara Peninsula, West of Hamilton," contributed by Prof. John Macoun, M. A., of Ottawa.

The main object of the essay was to direct the attention of botanists to the desirability of thoroughly exploring the locality in which they reside, so that the gaps at present existing in our botanical knowledge might be filled in. A discussion followed.

THURSDAY, JANUARY 26th, 1893.

SPECIAL MEETING.

The President in the chair.

The Curator announced an addition to the Museum.

After the transaction of business, Mr. S. B. Sinclair, B. A., was called upon to read his paper, entitled "The Golden Mean in Wealth." After stating the views of Aristotle, that virtue is a means between two extremes of error, the essayist went on to show how the people of England had by legislation curtailed and finally overcome the tyranny of an absolute monarchy.

It was then pointed out that the accumulation of enormous wealth by individuals led to absolutism in the financial world. It was held that there should be a curtailment of this absolutism through legislation. A general discussion followed.

THURSDAY, FEBRUARY 9th, 1893.

REGULAR MEETING.

The President in the chair.

Two applications for membership were received.

The Photographic Section then gave a lime-light entertainment. The majority of the views shown were photographed, and prepared for the lantern, by the members of the section.

THURSDAY, FEBRUARY 23rd, 1893.

SPECIAL MEETING.

The President in the chair.

Mrs. M. Davidson and Mr. John Pottenger were elected ordinary members of the Association.

Mr. R. T. Lancefield then read a paper entitled "Studies in Sociology." A general discussion followed.

THURSDAY, MARCH 9th, 1893.

GENERAL MEETING.

The President in the chair.

The Curator announced a contribution to the Museum.

Mr. L. Woolverton, M. A., of Grimsby, was called upon to read a paper entitled "Fungi Affecting Fruit." The essayist pointed out that science is aiding in no slight degree the cause of agriculture, and that of late scientists had given its practical side more attention than ever before. A number of the insect enemies of fruit were exhibited, drawings were shown, and formulæ given to destroy pomological pests. On the conclusion of his paper the lecturer answered a number of questions.

Mr. H. B. Witton moved, and Mr. M. Leggat seconded a resolution of condolence with the widow and family of the late Richard Bull, Esq., for a period of fifteen years Treasurer of the Association. The meeting was then adjourned as a mark of respect to the memory of Mr. Bull.

THURSDAY, APRIL 13th, 1893.

REGULAR MEETING.

The President in the Chair.

It was announced that the Annual Field-day of the Association would be held at the Albion Mills, on Saturday, June 24th.

The President reported that the Council had appointed Mr. H. B. Small, Corresponding Member of the Association, representative at the forthcoming meeting of the Royal Society of Canada, to be held in the City of Ottawa.

The Curator announced the receipt of a donation to the Museum.

Dr. T. W. Reynolds then read a paper entitled "Fads." In it the reader recommended the collecting and arranging of scientific and other curiosities. A discussion followed.

THURSDAY, MAY 11th, 1893.

REGULAR MEETING.

The President in the chair.

The application for membership of Mr. Arthur E. Mason was received. On motion, the rule requiring that applications for membership be voted on at the following regular meeting, was suspended. Mr. Mason was elected an ordinary member of the Association.

The annual meeting was then held. The following reports were read:

Report of the Council, by the Secretary.
" " Treasurer, by C. R. McCullough.
" " Biological Section, by H. S. Moore.
" " Philological Section, by W. H. Elliott, Ph. B.
" " Geological Section, by A. T. Neill.
" " Philosophical Section, by S. A. Morgan, B. A.
" " Photographic Section, by Wm. White.
" " Corresponding Secretary, by Thos. Morris, Jr.

The following office-bearers for the ensuing year were elected:

President, - - - -	A. Alexander, F. S. Sc. (Lon.)
First Vice-President, -	A. T. Neill.
Second Vice-President, -	T. W. Reynolds, M. D.
Corresponding Secretary, -	W. McG. Logan, B. A.
Recording Secretary, -	C. R. McCullough.
Treasurer, - - - -	Thos. Morris, Jr.
Curator, - - - -	Alex. Gaviller.
Asst. Secretary and Curator,	Walter Chapman.

Council: James Ferres, A. E. Walker, P. L. Scriven, William White, W. H. Elliott, Ph. B.

THE POSSIBILITIES OF FICTION.

Read before the Hamilton Association, October 27th, 1892.

BY W. SANFORD EVANS.

I have chosen "The Possibilities of Fiction" as the title of the paper I have prepared for this evening. My paper consists of a few thoughts on some of the principles underlying fiction. I have not attempted the criticism of particular works, but have attempted rather to present certain general aspects which it seems to me must be understood and decided upon before there can be such a thing as intelligent criticism or appreciation. The study of these general principles and general aspects will make clear to us what is greatest and most beneficial in novel-writing, or, in other words, will make clear the possibilities of fiction: hence my title.

The world to-day has no universally accepted standard by their conformity with which we can finally adjudge the relative greatness of authors or of individual works. There is no reason from the nature of the case why such a standard could not be formed, but it is very evident that this standard must be based on the possibilities of fiction, and that these possibilities can be discovered only after careful and scientific investigation of the principles involved. My desire for personal satisfaction on this subject has led me to devote some study to it. To present even the few results I have already attained, in the short time at my disposal, is not possible, and so my treatment must necessarily be incomplete. My only object will be to offer some general thoughts in the hope that they may prove suggestive.

There came a time in the history of my reading of works of fiction when I paused to ask myself why I read them. I had a preference for certain works and for certain authors, and I paused to ask myself the reason for my preference. There were periods, even of serious enquiry, when, of all the sources I knew, I turned to fiction to seek something to satisfy the undefined questioning that agitated me; and I paused to ask myself if it might not be, if it were not true, that in the novel there can be expressed better than

in any other way some of the truths about life that it is most important for us to know. Since that time the novel, in its potentialities at least, has been something more to me than a means of pastime. The more I have thought upon the subject the more I have been convinced that the novel holds possibilities of power and influence that make it no unworthy medium for the greatest thinkers of an age. The novel is great. The time has gone by when novels as a class are to be forbidden, or even questionable, reading, and the time has come when they should be treated scientifically. The modern novel is not a toy; it is something instinct with modern research and modern thought, it is something that gains a readier and wider access to us men and women and exercises a more subtle and potent influence over us than any other kind of literature. Tell me what kind of novels a man reads and I will tell you how to sway him.

I have thought that the most satisfactory form in which I could put what I have to say would be by proposing and answering some of the questions that naturally arise. These questions are:

1st. Why are novels written?
2nd. Why are they read?
3rd. What place do they fill?
4th. What is the greatest and most beneficial kind of novel?

To give full answers to these questions would require many lectures, and so, as I have already said, my treatment must necessarily be rather suggestive than complete.

In the first place, then, Why do we write a novel? What is a novel from the author's standpoint? An answer to this is sometimes given by saying that "the object of the novel is to give pleasure;" that is, the novel is written to give pleasure to the reader, but surely such an answer is altogether superficial. No high art can be explained by it. Can we think for a moment, without its cheapening our estimate of all great artistic work, that George Eliot, while elaborating with such earnestness, sympathy and skill, the development of her characters and plot, was actuated solely by the desire of giving pleasure to others? Can we think it of Thackeray as he gives us the history and fortunes of Becky Sharp? Can we think it of Victor Hugo while under the creative inspiration that has given us the passion and the pathos of Les Miserables? Can we think it of Shelley,

as we are spell-bound by his beautiful verse, any more than we can think that the little skylark about which he wrote:

> "That from heaven or near it,
> Poureth its full heart
> In profuse strains of unpremeditated art,"

sang only to please the poet who gazed after it and cried,

> "Teach me half the gladness
> That thy brain must know,
> Such harmonious madness
> From my lips would flow
> The world should listen then as I am listening now"?

No; I cannot believe that artistic production of any kind can be explained by referring it to a desire to give either pleasure or instruction to our fellowmen. Art is not something done for the sake of its effects on others; it is something natural, we might almost say instinctive; and so we must look deeper for the explanation, we must find it in some fundamental psychological fact. That psychological fact is, that every perfected thought tends to express itself in some concrete form, either in imagination, or outwardly, in matter.

It is in the highest degree necessary, in this connection, that we should have a correct understanding of what imagination really is. It is a mistaken idea that imagination is identical in meaning with the fantastic or the exaggerated. It is true that in popular usage it often has such a meaning, and this is particularly true of the conjugate adjective 'imaginary.' To say that a work is a work of imagination is taken as predicating of that work a certain quality of unreality and unnaturalness; and the word seems nearly always to hold for us more or less of such signification. To confine the word imagination to this meaning is to mistake the true nature of the faculty; it is to define a generic word by a specific example. Imagination is the faculty exercised in Dante's Inferno, but it is also the faculty exercised by the scientist when he represents to himself the motions of the atoms and ultimates in a molecule of matter. It is the faculty by which the mechanic sees, before he has shaped a bit of material or has put a line to paper, in fullness of proportion and intricacy of detail, his wonderful invention. It is the faculty that is used every day in the most strictly scientific and in the most prosaic affairs of life, as well as in the wildest flights of the poets. What is imagination? It is image-making power. When we imagine

we make an image. It may be an image of plain fact or it may be an image of fairyland. What determines the kind of image we have is the abstract conception that lies back of it. If I understand all that is known of matter and the laws of its motions, I will have little difficulty in imagining atoms and their modes of motion, though no one has ever seen an atom. If I understand the laws of machinery I will have little difficulty in imagining a practicable machine that may be unlike any other in existence. According as my conceptions are complete so will my image be definite. This transition from conception to image is constantly made. Our conceptions are ever passing into images, and on the other hand the images presented to us are constantly being rationalized into abstract conceptions. These are two of the principal processes of mind; they are not separated in experience, but flow into one another.

I hold, then, that imagination is simply image-making, that we make images of our abstract conceptions; and that the distinctness of the image depends on the completeness of the conception. This image-making is a natural process. In this natural psychological process we find the source of art. Every perfected thought tends to express itself in some concrete form, first in imagination, and then afterwards, at our discretion, in a more permanent form in matter. This expression in matter, provided the conception of which it is the expression be of a certain kind, is a work of art. The ultimate basis of criticism of a work of art is the conception of the principles of the subject in the mind of the artist, and will not be found in anything that may be called imagination. I would like to emphasize this as I shall return to it again.

If the perfected conception in the mind of the artist be a conception of the ideal in the female form, we will have the Venus of Milo as its expression. If that perfected conception be one of French peasants with heads bowed, while, "with sound stupendous, throbbing," there "tolls the great passing bell that calls to prayer for souls departed," we will have "The Angelus" as its expression. If that conception be of the quality we call poetic, it will express itself in poetry. If that perfected conception be one of human life we will have a novel or a drama.

Lord Lytton says "What Nature is to God, Art should be to man." Art is man's creation, it is the materializing of what he knows, in the same way that this universe is the visible and tangible

expression of some universe that God knows. Indeed are we not most god-like when we have reached that point in the fullness of our development where our thoughts are complete enough to take on a material form and stand alone.

If anything further be needed in support of my position that the explanation of artistic production is to be found, not in a wish to please or instruct, but in a fact of our natural constitutions, I will only ask whether the passionate devotedness to their life-work, their absorption and joy in their work as work, of those men and women whom the world has called great artists, does not demand an explanation in something other than their desire to tickle the æsthetic sensibilities of mankind. It is very true that the desire to give pleasure, as well as many other desires, may enter as elements in the production of many works of art, but they in themselves can never account for any of these.

If the opinion of art here outlined be correct, the novelist will be one whose conception of human life finds expression in the portrayal by words of acting and mutually inter-acting men and women. Words are the material of this artist; that with which he wishes to express his conception of human life. From his knowledge of the principles or the customary processes of human nature he constructs in imagination individual men and women, and then presents them to us as naturally as can be done through the medium of words. And he does this because in the inscrutable counsels before the world was made it was decreed that it should be natural for man to try to express every completed conception in some material form. This is what a novel is, and this why we write one.

We have thus far looked at the novel from the author's standpoint, let us now look at it from the reader's, and ask: 2nd, Why do we read one? I shall not give an exhaustive list of reasons, for I suspect that such a list would be almost co-extensive with the lists of temperaments and moods, but I will give the principal reasons that have occurred to me. We read a novel:

1st. For pleasure. The reading of many novels is an unalloyed pleasure and there are many times when we pick out this kind of novel and read it for the mere feeling which it excites. We never attempt to analyze the story or search for any significance—we merely enjoy it.

2nd. We read a novel for excitement. In this case we select sensational works and read them for the sort of intoxication they induce. This motive for reading is very common and is liable to lead to the same kind of intemperance that the desire for stimulants of any other kind may lead to, and to carry this analogy a step farther, these novels may have a proper place as medicine.

3rd. We read novels for relaxation from study or care. This is quite distinct in its motive from the two reasons mentioned above. When the mind is tired and tense from work, we often desire, and it is at times almost necessary, that we should have something to divert us and relieve the strain. We seek and find this something in the novel. The novel-reading of the great majority is explained by the above three reasons, but there is a fourth which is most important of all, namely:

4th. We read a novel to find out more about life, or for instruction. It may be objected that the novel is not read for this purpose, but I reply that from personal experience, as well as from the experience of others, I know that it is so read. In fact, do not a great proportion of modern novels appeal directly to this class of readers, because in them are propounded new religious, social, and philosophical theories? They are written on the supposition that there are those who will read them thoughtfully and critically. It may be objected, nevertheless, that to make a text book of a novel is to put it to a use for which it was never intended. I ask for what use it was intended? I have already dealt with the opinion that the object of the novel is to give pleasure, and shown in contradistinction that the object of a novel is to give expression to a conception of life. And is not a conception of life, or any phase or experience of it, as worthy of study as a conception of nebulæ, or material elements, or anything else? Is it not, indeed, more worthy of study, inasmuch as how we live is of more importance than what we know? It seems to me that the reading of a good novel is only begun when we have followed the story; it is completed only when we have discovered the conception the author must have had of the phases or principles of life presented, and when we have stored these thoughts up in a form for practical use. This is true novel-reading. We study many classic dramas in this way, comparing part with part, yet the novel holds greater

possibilities than the drama. This paper is merely a few thoughts upon the novel that is most worthy of such a reading.

The third question is :—

3rd. What place does the novel fill? Philosophy finds its proper expression in a strictly accurate treatise; logic, in the syllogism; geometry, in hypothesis and demonstration; dreams and flights of fancy, in poetry. Is there anything that finds its most effective presentation in the novel? Is there anything left undone until the novel does it? Is there any work the novel can do better than any other kind of literature? I think there is.

(1). It is the best means of extending our experience and knowledge of life beyond the bounds of our personal lot. No matter how far we may have advanced in self-knowledge, and how skilful we may be in studying the life around us, it must happen, from the necessarily narrow range of an individual, that we will not come in contact with a great many important facts in life, or that we will meet with isolated facts which we cannot rightly understand because we cannot compare them with others of the same kind. A novel can best supply what we lack because it is the best form in which others can put their experience and observation of life.

As growing out of this use of it:

(2). It is a more effective way than any other of extending our sympathy with our fellowmen. The reason for the lack of sympathy that is seen between class and class, between rich and poor, between employer and employed, for example, is found in the fact that we do see people as we see ourselves. We often hear quoted:

> "Oh! Wad some power the giftie gie us
> To see oursels as ithers see us."

I would like to transpose this and make of it a prayer that would give utterance to an even more deeply-seated need:

> "Oh! Wad some power the giftie gie us
> To see each other as we see ourselves,
> 'Twould from mony an evil free us,
> And foolish notion."

If the employed could recognize that his master's life is just as full as his own of anxious care, and thought, and hope, and disappointment; if the employer could recognize that his servant has essentially his feelings and needs, there could not but grow up an ever-strengthening bond of sympathy between them. The work of creating this sympathy cannot be done by quoting statistics or by

general statements. We read in our papers every day statistics of disasters, for example, of mining disasters, giving the number killed and an inventory of the loss, and we are comparatively unaffected, if, up to that time, we have had no bereavement in our own experience. But hand that same paper to one who has passed through such a scene as that recorded, and even the barest figures will make him shudder. In order to interpret statistics and general statements we must have a sympathy already in existence founded on our past experience. If we have not this we must have the scene presented to us with such vividness that we will live through it in fictitious experience. So in the case of the rich man and the poor man. It may accomplish little or nothing to present the one class with general statements about the other; what is needed to arouse sympathy and understanding is that a life be presented in the concrete, and it seems to me that this can be done more effectively in a novel than any other way, even than by introducing a living person or by visiting one in his home and surroundings, because then we see only the outward which shows the difference, and do not see the inner life of thought and feeling which shows the brotherhood. In the novel, and in the novel only, can be shown at the same time both the outward and inward life, and this not by abstractions but in the form of a fellowman. We see that he is influenced by the same motives that are powerful with us; we discover our common humanity, and we discover that our humanity is common; and, as one writer says, "more is done toward linking the higher classes with the lower, toward obliterating the vulgarity of exclusiveness, than by hundreds of sermons and philosophical dissertations." In the work, then, of extending an understanding and sympathy between class and class, and between man and man, there is no instrument that can be more effective than the novel.

(3). The novel is incomparably the best means of presenting a great deal that is essential to our development. As preliminary to the discussion of this point I would like to ask the question: What is the greatest in life? What is the *summum bonum*, the ethical end of life? We find this question has been mooted in all ages and that philosophical schools still divide upon it; but the highest and truest philosophy answers the question in one word—*self-realization*. What is the ethical end of life, the *summum bonum*,

the highest good? It is to develop into actuality all the possibilities of our natures. The highest in life means the highest in every thought and action, the purest in every motive and feeling. To attain this three things are necessary:

(a) We must know where we stand now—we must have self-knowledge.

(b) We must know what courses of thought and conduct lead to deterioration so that we can avoid them.

(c) We must know what feelings, thoughts and actions are great, so that we may cultivate them. How are we to attain this knowledge? Any one who is a great student of human nature knows how very rare anything like adequate self-knowledge is; most of us are perhaps more ignorant of self than of anything else within the range of our experience, and no one, at this stage of the world's progress, can lay claim to a full knowledge of himself. We are perpetually congratulating ourselves that our actions and motives are magnanimous when they cannot possibly be anything but short-sightedly selfish. We are continually practicing deception on ourselves and we never suspect it. We do not realize the narrowness of our conceptions of what is highest. We do not try to recognize in their incipiency the tendencies and habits that will soon become too firmly set to be altered. Socrates revolutionized philosophy with his "Know Thyself," and I believe that it will have to be recognized that this self-knowledge is as essential to moral progress as it ever was to intellectual. How shall we attain it? You say, Study yourself. Yes; but suppose I should come to you and express a desire to know all about astronomy you would not say to me, Go and study the stars. If I wished to know all about geology you would not say, Study the ground. You would say to me, Put yourself under the best masters and get the best text-books and you will then find out all that the study of ages has established, and you will be in a position to make fresh advances. You would tell me that unaided I could not in a life-time hope to arrive at anything comparable to the fullness of knowledge possessed by a modern school-boy. The world advances because one age starts where the last left off. The ancient Norsemen had this idea when they compared life to a tree called Ygdrasil, which is growing age by age. We are among the clouds, not so much on account of what we have done, as because we are supported by, and grow out of, all the life that

went before: and the coming age, the next year's twigs and leaves, will be nearer heaven still because we have lived and grown.

It seems to me that it is as necessary to have text-books and guides in a study of self as in any other study. Works on psychology do not cover the kind of self-knowledge we are considering; but even if such works did they would not supply the want. What is needed is a concrete presentation of the facts and processes of human nature. We may learn a good deal about our bodies from scientific generalizations, but these cannot take the place of a physiological chart, or of actual dissection. To a psychological chart we give the name of novel. In a novel we find not generalizations, but people who act as we do, and we find, besides, what the author, who is a specialist in this study, believes to be the motives that prompted these actions, and we also find what he believes to be the effect of these actions on the actors and on others. We find there what the author has discovered to be the modes of life of the men around him and the ends of life we have practically and virtually before us. He traces and exposes the influences that are abroad in the world by showing their effect on men and women. We find the results that he has arrived at in this science of human nature, and we find them in the form that is most easily understood and most effective. He shows us where we are, which, as we have noticed above, is the first thing we require to know in order to self-realization. And I ask in what other way can this be shown?

Then in his bad characters he shows us the course of life and thought that lead to disaster, or deterioration, or to what is unworthy, and here we find what we have to avoid. In his good characters we find what courses of life and thought are necessary to development, and here we find what we ought to cultivate.

It seems to me that the greatest need of the day is guidance in detail. We have righteousness preached at us, but we want to know what righteousness is when translated into the next act that we have to perform, or into the customary acts of our lives. We want to know what is better and worthier than what we are doing, and if this could once be shown, I have sufficient confidence in human nature to believe that a majority would try to follow it. This guidance can be given in a novel more directly than in any other way, and for this reason it is an essential supplement to treatises or

sermons. A small minority only can be directly influenced in their conduct by an appeal to their reasons with abstract truth. You may persuade a savage that civilization is a good thing, but, unless, in addition to this, you instruct him step by step in the elements of culture, there is every chance of his remaining a savage. You may inculcate in a man the virtue of self-sacrifice, but unless you can tell him, at the same time, how self-sacrifice will show itself in his daily conduct, and in his particular acts, it is more than probable that he will go through life just as selfish as the rest of us. We have made wonderful advances in all the arts except the art of living. We are able to control the forces of nature even to the mystery of electricity, but we, as a race, are making no advance in that which is nearer to us, and should come first, the controlling of ourselves and the conforming of lives to a standard that is ever becoming higher. Lest I should seem to overstate the case I would like to give some testimony in support of what I have said. A writer in *The Nineteenth Century* says: "Crime in England during the last thirty years for which we possess official returns, has not decreased in gravity and has been steadily developing in magnitude." In the United States, where we would expect to find life-problems being worked out under the most favorable conditions, what do we see? Hon. Andrew D. White in a recent address said: "The number of deaths by murder in the United States is more than double the average in the most criminal countries of Europe; and this number is increasing in our country every year and in a ratio far greater than the increase of the population." The statistics of 1890-91 show an increase of less than 25 per cent. in population, but an increase of 59 per cent. in the number of persons charged with murder. President Schurman, of Cornell University, said not long ago in speaking of divorce: "The United States grants more divorces than all the world put together. We grant annually more than 25,000—a hundred a day if you give the judges a Saturday half-holiday." If the present rate of increase should continue "a hundred years from now more than half of all marriages will be terminated by divorce." He says the evil of divorce is not a single isolated factor in our modern life, but only one of many kindred aspects of what we may call the modern spirit, "which is a tendency to selfishness, to impatience, to immorality, to irreligion." Our daily newspapers are little but a catalogue of crimes in all grades of society. The world

has had a great deal of righteousness in general preached at it, but very little righteousness in particular. Now I ask, is there any medium so effective as the novel for the presenting, and so the teaching, of the great desideratum—righteousness in particular. Indeed, is there any other way in which can be shown the courses of thought and action that ultimately lead to fault and vice, and the courses of life that lead to purity and strength?

But now, in view of all these things, what must we decide to be the greatest in novel-writing? What kind of a novel is the highest? I would define the greatest in fiction to be the novel that portrays and describes, with the strictest truth to human nature, as nearly as can be done in written language, human life, not only as it exhibits itself in action but also as the actors are conscious of it, and shows the operations of mind and the conflicts of influences with their subtle effects. This novel makes men and women act before us, it describes the hidden life they lead in other realms than that of sense; it also traces the unrecognized workings that are gradually forming or changing their characters. It is the presentation of a complete human being; we are shown his outward life and his inward life; we know those processes by which he has become what he is and those by which he is developing or narrowing into what he will be. We must bear in mind in connection with this definition the many limitations that the nature of the case will put upon it. The novelist has only four or five hundred pages, say, in which to represent some phase of life. It is impossible in that space to put down everything that would be found in like circumstances in actual life, and it is not an object with him to do so. He aims to give a complete whole in a limited space, and to do so he must carefully select those points that are most prominent and most essential. He must get a proper proportion, a proper perspective, in his work. Out of this fact there arise a great many technical rules of art with which it is not my present purpose to deal. I am treating only of the matter of the novel and am not considering at all the question of the form in which this matter may be best presented; and so, when, in the above definition, I said the greatest novel must be strictly true to human nature, I did not mean that it must present an exhaustive picture of life, but that whatever points it did present must be strictly conformable to the laws that govern men and women.

In the first place, before going on to establish this definition, we will have to meet an alarming array of opposing authority. Taine defines a novelist to be "one who labors to manifest the invisible world of inward inclinations and dispositions by the visible world of outward words and actions;" that is, Taine says that novel is the highest which confines itself to words and actions and has nothing directly to do with the inner life My definition expressly and emphatically includes the portrayal of this inner life. Taine's definition is endorsed by Mathew Arnold and is accepted, implicitly at least, by many critics. I think this definition is already a little out of date, for modern novels almost universally show the works of the watch as well as the dial. The definition is too narrow, and for this reason: If we have a full, true conception of life we will find that we cannot embody it in this kind of novel which is only an extended form of the drama, because the life you and I live is not, cannot be, represented by our words and actions. What we say and what we do may point to the motives that outweighed all others, but will give no sign of the terrible struggles between conflicting motives that mark the crises of our lives and are more truly, and more vividly, a part of our experience than anything external can be. There may be raging within us a battle whose issue entails more momentous consequences for our lives than did Waterloo for the political future of Napoleon, and yet the only external facts to be noted may be the pale cheek, the strained and anxious brow. Little of our joy and grief is shown in our smiles and sobs. The actual circumstances of the moment form but a small part of our experience at any time; memory and imagination give nearly all the depth and power. There is probably no life without its romance, and yet there are very few lives in which there is any romantic incident. Romance has a solely subjective existence. The highest workings of our natures in intellect and imagination can show themselves only very indirectly and ambiguously in words and actions. Nearly all our wealth of passionate, rich, and exquisite feeling is known only to ourselves and never betrays itself in word or gesture. These secret workings of mind and heart make the real life of each one of us, and we often long for someone who would judge us, not by the conventionalities required of us, but by this truest and best life which is throbbing or soaring within us. All these realities of life may be talked about and described but cannot be made to exhibit themselves. Do not

these considerations, together with many more that might be adduced, clearly show that there is a great deal in our lives that cannot be embodied in a novel that confines itself to the external? There is no room in the novel, as defined by Taine, for the treatment of all that is deepest and most real in human life, therefore I say the definition is narrow and the novel he conceived falls far short of the possibilities of fiction.

But in the second place, from the fact that I have insisted that the greatest novel must be true to human nature, I am met by the re-action that has set in against what is called realism in fiction. In these days to say you are an advocate of realism is taken as almost equivalent to saying you like filth, or, at least, insipidity. Now, in the first place, I protest against such a prostitution of the word realism. It is not real life that most of these books present to us. A writer on this subject says: "Realism during the last thirty years has strangely deviated from its fundamental principles; it has become rhetorical; it has become idealism turned upside down—the idealism of ugliness, vice and crime. * * This illusion is aided by the minute care taken by modern narrators to describe the surroundings, the places and the objects, in which their fantastic personages live and move." There is that in me which makes me believe that ugliness, vice, and crime, truthfully presented, cannot be attractive, for in that presentation we would find misgivings, loss of hope, and all the gentler feelings, atrophy of noble impulses and generous thoughts, gradual narrowing, hardening, and despair. Even granting for the moment that these novels against which the reaction has set in are true to nature, this could not be used as an argument against truth to nature as an essential of the greatest novel; it could only be used as a crushing weight against the taste and common sense of the authors of such works. Beauty, goodness, faithfulness, and honor, are as much truths of life as ugliness, vice, and crime.

Having thus to a certain extent cleared the way, it remains for me to bring forward some considerations that will tend to establish my definition, which is, that the greatest novel is that one which, with whatever phase or circumstances it deals, is true to human nature, and gives us not only the external but also the inner life of thought and feelings, and the formative influences and the tendencies at work. I claim that this is greatest,—

1st. Because it is most beneficial. We have seen that it is one of the possibilities of the novel to be the best means of extending our knowledge of life beyond the bounds of our personal experience. To do this the novel must give us the inner life, because the knowledge of that life is most important, and it must present that life truly or else we will gain no knowledge at all, but will be led aside into error. The novel I have defined is able to supplement our experience and so enable us to have an acquaintance with the principal facts of life, after we get which it is an easy matter for us to infer and deduct until we get rules of conduct, of motive, and of thought. I am not advocating the novel that preaches or has a moral at the end. Any amateur in dialectics can draw conclusions, but it takes a trained scientist to establish the premises, to discover the real facts and laws; and this is nowhere so true as in the science of life.

It is another possibility of the novel to be more effective than any other agency in creating a sympathy and an understanding between man and man, and between class and class. To do this it is very evident that the men and classes must be represented as they are. How much do you think it would aid in bringing about the result if we found in our novels nothing truer to life than the peasants in opera, those "lyric rustics" in their elegant attire? How much do you think it would aid in bringing about this result if we found in our novels nothing truer to life than the peasants in poetry, who are always "jocund as they drive their teams afield," who are always cheerful and smiling in harvest, who sing serenades and make bashful love? How much of the misunderstanding that now exists do you think is due to this poetic falsification, which calls out our sympathy for idyllic shepherds and idyllic plowmen that have no counterparts in nature. And to bring about this sympathy and understanding we must find in the novel more than we can see about us every day. We can see the difference in dress, we can see the difference between a mansion and a cottage, we can see the difference in manners, we can hear the difference in speech. These, as I have before said, are the things that mark the separation. We want to know the things that mark the brotherhood. These are found in the thoughts, the feelings, the aspirations, the resolves, the temptations, the conflicts. We must be shown the force of circumstances and all other shaping forces that have brought about the difference that remains after we have discovered the essential

brotherhood. Then, and only then, can we fully sympathize and understand; and it is very evident that to bring about this result the novel must give us more than words and actions and must be true to nature.

We have seen that it is also one of the possibilities of the novel to be the best means of presenting a great deal that is essential to our development. It is equally plain in this case, as in that we have just been considering, that to accomplish this result the novel must give us more than the external and must be true to human nature.

To benefit us by giving us self-knowledge, a novel must present the courses of life that men actually follow, and must make plain to us the motives and principles that are really predominant. It is not moralizing that the world wants most, it is such an analysis of experience as shall lay bare its elements. It seems to me that after all these centuries the world to-day does not know enough about the universal malady, selfishness, for example, to give a satisfactory diagnosis. There are a great many facts referred in a loose way to selfishness, but where do we find the analysis that shows us the real elements, the psychology, of selfishness. They tell us that it is doing things for our own gratification, but this will not stand, because it makes it deliberate, and we all know that very little of the selfishness in the world is deliberate. We do not act for the purpose of gratifying ourselves at the expense of others, we simply do what seems best at the time. Then we will have to seek the root of selfishness in our knowledge of what is best and highest, or farther back still wherever our analysis may lead us. If we can once discover the true source it will be easy to prescribe a remedy. This one instance may help to illustrate what I mean by the necessity for an analytical and accurate knowledge of the facts of experience before we can form rules of conduct. The novel that truly represents the inner life gives us this knowledge. If, in this novel I am advocating, the character of a bad men is depicted with truth to nature, we will see the steps by which he became bad; he will not seem to us some one outside the pale of our common humanity, where he is virtually placed by too many writers; we will recognize in him a being like ourselves whose course of life has a sequence in it; we will find that he has motives that are to him as strong incentives to action as ours are to us; we will see in him what we might become if we took his first downward step. If the char-

acter delineated in this novel be better than we are, we shall know what life is to him and how we must act to be like him; we will find out what in the conviction of great men and women are the thoughts and actions that are worthier than ours. The greatest care, however, should be exercised by those novelists who attempt to represent the perfect man, that they should make their representatives strictly true to the nature of man. A novelist can lead us no farther than he has gone himself, either in actual experience, or in careful calculations upon human nature. No novel can be wholly beneficial whose characters are not possible to actual men and women in like circumstances. And, besides, if we are capable of indefinite development, as we all believe we are, then only God could describe a perfect man. The only ideal representable by man is an ideal of attitude towards the problems of life, an ideal of disposition, not of attainment. The only ideal characters are sincerely striving men and women; but it would not be difficult to represent men and women who have reached a greater degree of attainment than we have. I think it is very evident, then, that the novel I have defined must be the most beneficial.

We have seen that the novel is read not only for instruction, but also for pleasure, for excitement, and relaxation, and any novel that meets these needs may be a legitimate kind of novel and may have a right to be. I am not advocating one kind of novel to the exclusion of all others. I am attempting to establish that this kind is greater than all others. It cannot be urged as an argument against it that it is not fitted to please, as proved by the fact that a majority are not pleased by it. We do not consider that it is an argument against a Raphael, or a Michael Angelo, that a great many people prefer a chromo. There is such a thing as the development of taste in novel-reading. We are not born with a ready-made appreciation of what is highest in fiction any more than of what is highest in anything else. We may come in time to enjoy only that novel which is worthy of study just as we may come to enjoy Beethoven or Wagner. The novel I have defined may, then, not only be most beneficial but give most real pleasure, and to those who have once learned to appreciate it all others may appear comparatively trivial.

I know that very many people will take a decided stand against so serious a view of the novel as I have presented. Such a novel

and such a reading would not afford any relaxation which is one of the great uses of the novel. They will contend that we get enough of this kind of thing in real life, and that when we pick up a novel we want something quite different from the life we are living. We want to read about hair-breadth escapes, or about lords and ladies with incompatible virtues and vices, and impossible fortunes. I cannot at all agree with this opinion.

It is a very trite comparison, that of life to a voyage, but it is a very true one. We each have some harbor we would like to make. According to our temperaments and circumstances, our ambitions and desires adorn this island for which we set sail with all delights. Those who take this stand with regard to the novel, saying that we get enough of real life in what we are forced to do, and that our chief object should be to get something to occupy our spare moments that would take us off into other realms, seem to me to advise that in entering on this voyage we merely weigh anchor and give sail. When the necessities of sustenance or the urgency of gales forces us to work and think, we are to do so, but when such necessities are not upon us we are to read of seas that we can never sail, of ships that we never made, of islands fancy-formed. We are to lie back and dream of journeys

"Over the seas
With a crew that is neither rude nor rash,
But a bevy of Eroses apple-cheek'd,
In a shallop of crystal ivory-beak'd,
With a satin sail of a ruby glow,
To a sweet little Eden on earth that I know,
A mountain islet pointed and peak'd;
Waves on a diamond shingle dash,
Cataract brooks to the ocean run,
Fairily-delicate palaces shine
Mixt with myrtle and clad with vine,
And over-stream'd and silvery-streak'd
With many a rivulet high against the sun
The facets of the glorious mountain flash
Above the valleys of palm and pine."

Are there rocks ahead? We do not know. Are we sure that by driving before the wind or with the tide we shall ultimately reach our harbor? Are all the winds and all the tides certain to be favorable? Ought we not to change our course and beat up against the wind? We do not know. Is there really amid all the possibili-

ties of formation such an island as we seek? We do not know. Meanwhile we are sailing and dreaming. Can such a voyage be compared in any respect to that of the man who thoroughly studies his boat until there is not a thing he cannot do, not an emergency for which he is not prepared; then master the principles of navigation; then make himself perfectly familiar with the chart till he can place every rock and every shoal? When the sky threatens he understands it and prepares for storms, and when the squall strikes him he exults because he is ready for it and can weather it. When rocks frown he can escape them because he knows where the deep water lies. Is such a man's voyage all drudgery as compared with that of the man who dreams? Far from it. The sun is glorious at sea, the mist is weird, the stars are eloquent, the moonlight on the water is divine, and even the angry, crested waves are grand. His voyage is all pleasure, because he is safe, and he is safe because he has studied and because he knows.

For this reason I cannot believe in devoting one's time to fiction that is admittedly untrue to life. I am anxious to understand life, and have not yet discovered that the only pleasure is to be found in temporary escapes into other, imaginary, states of being.

But you say, since a novel is not written on account of its possible effect on its readers, so much as on account of a natural desire for expression in the author, we must look for the greatest in fiction in what is greatest from the author's standpoint, and surely that greatest will be found where he gives, as it is called, free scope to his imagination. I admit that before my case can be complete I must establish that what we have already seen to be greatest from the reader's standpoint is greatest also from the author's.

I think that, from this point of view, as well as from the reader's, there will be no discussion about that part of the definition which makes the greatest novel contain more than words and actions, for it is unquestionably greater in the author to exhibit not only the external but also the hidden sources of the external. The contention will settle around the assertion that his presentation must be true to human nature.

We have already seen that imagination is the power of making images of general conceptions. The difference in the images depends on a difference of conception. The difference between the works of Rider Haggard and those of Thackeray, for example, is not

so much difference in power of imagination as in the general conception of life and of what is worthiest of being represented. If this be true, and if we can determine what conceptions of life are greatest and best, then these conceptions adequately imaged will be what is greatest in novel-writing from the author's standpoint. To me it will ever seem that the greatest conception of life will be a conception of life as it really is, of the laws that actually govern it, and of the possibilities it actually contains. This is greatest because it is truest and because it requires incomparably the most knowledge in the author. To follow a possible character through a natural development it is necessary that we know all the circumstances in which the life is placed from its beginning to its close; we must know the bias given by heredity, by early training, by love, by hate, by opposition from others, by every motive, by every resolve, by every imagination; we must recognize the effect of the gradual strengthening or weakening of character, and of the formation of habits. Only if we have all this knowledge, and much more, and work upon it without error, can we produce a character with truth to nature; while only the slightest knowledge of the generalities of human nature is necessary to the production of a work when the only standard is an arbitrary determination in the matter.

The novel I have defined will be greatest, then, not only from the reader's but also from the author's standpoint.

A practical question will here at once present itself, namely, how are we to tell what is true to human nature, and so, greatest? Our judgments must be based mainly, I suppose, on our own experience of what life really is, and so at first will doubtless be very faulty, but this faultiness will gradually disappear with every additional experience. Twelve months from now our standard will be higher and truer than it is to-day. In this case, however, we are not left to verify everything by our own experience In history and in the thoughts of great and good men and women of all time—that is to mention other sources than the most authoritative, Revelation—we have the solution of many of the problems of life. And it seems to me that in our reading we should have before us a few general principles drawn from these sources to supplement our own experience in forming a basis of judgment. I think we may take it as established, for example, that that novel will not be true to the principles of life which

1st. Represents only that side of vice which makes it attractive. The world has found that vice brings disaster or meets it. Vice is an evidence of decay; growth alone is truly attractive.

2nd. Which excites and feeds passions that we should control, the passions that cause trouble in the world.

3rd. Which weakens our reverence.

4th. Which makes us feel anything other than an appreciation and sympathy for our fellowmen.

5th. Which by its false ideals unfits us for the practical duties of daily life.

6th. Which makes the end of life consist in something petty that takes away any aim worth nobly striving for. In this class I would put that large proportion of modern novels which virtually make the end of life a marriage which society will sanction, and the only aim, particularly for the heroine, to be pretty, so as to win attention from the other sex.

This list of principles might be largely extended. I think that each one should, at least mentally, draw out for himself such a list that he may be able to distinguish between the true and the specious, or the false, to the end that he may get from great novels that compensation for the narrowness of personal lot, that help toward a proper understanding and sympathy with his fellowmen, that guidance in self-knowledge, that warning against the very first step downward, and that call to something higher, which constitute the grandest possibilities of fiction.

My remarks have been all of a general nature. I know of no writer who fulfils all the possibilities of fiction, but, in my judgment, George Eliot, comes nearer to it than any other in the most important respects, though her representations are in a good many points only partial. I will not attempt to show this by a reference to any other works, I merely mention it to give my ideas a certain definiteness by pointing to a limited embodiment of them. To me her works seem most worthy of careful study, and most rich in returns, because she never allowed a striving after effect to interfere with her expression of her conceptions of the true workings of the principles of life, and her rare mental endowments pre-eminently fitted her for the study of these principles. There are many other authors I might mention, but she seems so peculiarly suitable as an illustration of my principles, at least of some of the more important ones, that I will

mention no other, since I have not the time to make such comparisons and distinctions as would be necessary for clearness.

I end where I began by affirming that the novel is great, that it holds depths and breadths and heights, both for author and for reader, which may never be fully compassed. The great demand for works of fiction, far in excess as it is of the demand for any other kind of works, is not necessarily a sign of depravity or of frivolity; it may be based upon the longing for that knowledge and guidance for which we seek in vain in philosophy or science, a knowledge of life as we must live it, and guidance that we may live it aright. We may not all seek for truth in the subtleties of metaphysics, we may not all count the stars and tell them by their names, but we must all live. Science may be for the few; conduct is for all. For this reason the novel must ever be of interest and of value, and the novelist may be one of the greatest of human benefactors. His responsibilities are great in proportion to his power of influence, which extends not only to the men of his own generation, but on from age to age. An old monk said to Wilkie, concerning Titian's "Last Supper:" "I have sat daily in sight of that picture for now nearly three-score years; during that time my companions have dropped off one after another, all who were my seniors, all who were my contemporaries, and many or most of those who were younger than myself; more than one generation has passed away, and there the figures on the picture have remained unchanged; I look at them until I sometimes think that they are the realities, and we but shadows." It has been made possible for us to put what is best in us into such a form that it shall live when we are gone, and by its permanence seem a reality beside which we are but shadows Truth only will so live, and our truth will live only until the world shall have advanced beyond us into deeper and fuller truth. A great mind's truth about human life may live from generation to generation, and from race to race, entertaining, instructing, confronting, and blessing, and helping to mould the life of all the world. Great are the possibilities of fiction.

NOTES ON BIOLOGICAL SUBJECTS.

Read before the Hamilton Association

BY WM. YATES, HATCHLEY, ONT.

I.

After a somewhat mild winter, springlike days were of frequent occurrence after the 24th of March. Some persons who had sugar bushes, began the work of tapping their maple trees as early as that date; the ice in streams and ponds had disappeared by the 4th of April, and on the 5th the first cranes of the season were noticed in these parts, and the piping of the frogs was heard.

One or two days of bright genial sunshine about the 1st of April, is sure to cause the blossoms of the *hepaticas* to peep forth amid the fallen dry leaves of the forest. These were ornamented with the downy flowerstocks and spreading petals of that welcome spring token in the warm afternoon sunshine of the 5th of April, and before the labors of the sap bush have ended the golden heads of the dandelion begin to adorn the sunny roadside "banks and braes." Although the *hepatica's* flowers are commonly assumed to be the earliest floral production of our Canadian spring, such is not the invariable rule, for on one occasion, now many years past, the blossoms of the *cardamine rotundifolia* appeared in a very sheltered spot of ill-drained woodland on the 19th of March—three or four days in advance of the *hepatica* flower, the same season. The *erigenia bulbosa* has also been known to expand its florets quite as early as those of the traditional *hepatica*, or the *sanguinaria*. On the elevated banks of the Avon stream near Stratford, Ont., specimens of this "harbinger of spring" have been found in flower many days before the remains of the wintry snowdrifts had vanished.

The cool temperature and drenching rains of the last days of May and of the first week in June had the effect of retarding the bloom of many species of early summer plants, such as *houstonias*, *castilleias*, and *polygalas*, *lupins*, etc., yet during the last week in May, and for some time afterward, there grew in damp spots by roadsides in some parts of Brantford and Burford townships patches of the

blue violet that were exceedingly attractive to the eye from the profusion of their flowers, and the density and extent of their masses of color. No gardening skill, perhaps, could exceed the brilliancy and charm afforded to every passer by these natural adornments of the boggy wastes and damp roadside borders. In the course of a summer season, many other common wild flowers evince the same *social* habit, and gratify the æsthetic craving that perpetually exists in the human mind. To give instances we need only mention the Blue Iris groups, so exuberant about the 20th of June; then, next, the Tall Vervain, *verbena hastata*, seen during the latter part of July; then the Cardinal Flower of mid-August; and lastly, the immense multitude of Asterworts (including the yellow golden *solidagos*) of the autumnal months. At the present date the clustered masses of the White Aster never appeared in greater glory and profusion on our roadside ditch banks; and in the ardent noon sunshine hosts of gaudily colored butterflies hover aud disport themselves around these vegetable denizens of the wilderness. The species we have just alluded to seem to be (Aster) *corymbosus* and (Aster) *dumosus*. There is also another very noticeable species whose multitude of congregated blossoms afford a massive expanse of pleasing lilac tints. These are most common in marshy situations. Then the more robust and tall growths of the strikingly beauteous purple New England Aster are to be seen on dry banks near fences, and, occasionally, near ditches. This in altitude and luxuriance of growth, nearly rivals its relatives of the golden-rod genus. As if imbued with a love of contrast, groups of white butterflies fluttered and rested on the purple blooms, whilst the large red and florid tinted lepidoptera mostly haunted the paler hued cymes of (Aster) *corymbosus* and one variety that resembled (Aster) *memoralis* or (Aster) *ptarmicoides*.

On the margin of the woods, if not also in the interior, the sere autumnal tints have now begun to manifest themselves on the foliage of the maples, and a number of the walnut trees are already shedding their leaves. "The touch of autumn" seems capricious—a single branch, perhaps, aglow with yellow, orange and crimson, while on the remainder of the tree, a dull green lingers. The tints of decay show first on the margin of the leaf, then extend to the midrib, and the rich hue proves transient, soon changing to a dull brown; then the leaf shrivels and falls. Some of the ferns, also, in

shady recesses of the forest, exhibit the same sensibility to the lowering temperature of the September nights, and suddenly *bleach* or change to an interesting cream color ere they droop and vanish under the influence of the chill rains and gales of October.

Just now the mimetic tendencies in nature are plainly manifested in the white flowers of the snake-head, which is a common growth in the shaded bogs of this vicinity There is an idea of mockery or derision conveyed to one's mind on a close scrutiny of this remarkable flower; and the remembrance of the bloom of the *cyprepedium* to an Indian moccasin is perhaps not less suggestive. Again a very slight exercise of the imaginative faculty is required to see in the flowers of the Fringed Orchis of the same bogs, the outlines and expression of a benign human countenance! Only yesterday the same *mocking* trait was very evident on a number of groups of Golden Rods on which those ligneous turbinate excresences, near the summit of the plant stem, had become *quite red* under the influence of the fervid solar rays of September, and assumed a most fraudulent "fruity" appearance. These semblances made one think of the historical "apples of Sodom." In clusters of these plants by the roadside for a distance of miles, about seven-tenths of the individual growths had been victimized by this supposed parasite. In one, also, if not in both of the two species of baneberry, *actæa spicata*, a similar humor of feigning seems predominant. In the white berried variety, the fruit and its mounting or arrangement, mimics the work of the skilled confectioner, and resembles the sugar-coated investiture on elaborate frost cake. What a ruby-like tint, resemblance, and suggestiveness is seen in the fruit of the Wahoo or *euonymus*, *var obovatus*, than which scarcely any substance can be more insipid to the taste. The luscious red, too, of the ground cherry, and of the *dulcemara* and perhaps some other members of the Nightshade family, give a promise to the eye which is not carried out, or is even treacherous, to the gustatorial sense. The fruit of the Dog-wood, *rhus venenata*, has a close resemblance to that of the white currant bush, but at the same time is an acrid poison, yet at a certain time is utilized as food by the ruffled grouse, (and with impunity to the ornithic consumer). The coral ruby-like fruit of the arum (Arisæma) *triphyllum* is said to have a seductive look, and has been eaten by children with painful, if not with fatal results.

The tendency to imitation in tree foliage, and in plants also, is very marked, and is perhaps too extensive a subject to be comprehended in the present communication, but one or two instances may not be thought irrelevant: For instance in the Mahonia, *Berberis aquifolium*, there is a likeness to the crisped and spinous leaves of the European holly, also a resemblance in the glow of color in the berries—at first orange-colored and afterwards blue.

In the form of stem and leaves of *Euphorbia polygonifolia* or of *E. maculata* (Knot Grass Spurge), the imitation to *illecebreæ* is so close as sometimes to deceive a superficial observer. The very curious reticulations on the leaves of the Rattlesnake-Plantain, might suggest patterns for an artist in wicker, or basket weaving; and the bronze helmet and vizor of the armoured knight of the mediæval periods, may have been copied from the seed capsule of several species of *scutellaria* of swamp margins. In this last mentioned instance the *imitator* and *imitated* may be thought to have illogically changed positions.

In some of the twining stems of shrubs, there is an exact *fac simile* to the scaly covering of the snake, as well as to the ophidian constrictions and contortions. A particular instance of this feature may be sometimes seen in the Moonseed shrub, *Menispermum canadense.* There is, also, something that may perhaps be termed "fantastical" in instances of "albinism" in the motley designs sometimes *etched in white* on the leaves of the common turnip, on pumpkin leaves, and quite frequently, on ribbon grass, as if the beginning of a whimsical design which had not been fully carried out, but abandoned for more practical and perfect ends. If it might not be thought a rambling from our orbit, one might finish by alluding to analogous traits in animal life, as in the curious etching on the upper side of the webbed feet of the Crested Grebe, as if put there to indicate the proper manner of folding the membraneous expansion between the toes when not in use, as a closed umbrella; also the rake-like appendages (for more efficient scratching among leaves) on the *sides* of the *toes* of the Grouse.

As we have introduced bird life, let us mention having seen crows with several *white* wing-feathers, and with a part of the toe-nail *white!*—and the color of the remainder of the bird, black as ebony! —suggesting that something, if only a modicum of pigment had been suppressed, as if "on second thought."

The tufts of crimson and orange colored fibres that serve as a "nidus" to the larvæ of the gall cynips of the Dog Rose bush, (that, a few years since, grew abundantly on the Hamilton commons, not far from the Insane Asylum,) may be mentioned in this connection.

In the prominent white involucre of several of the Dog woods (natural order *cornaceæ*) and notably in *Cornus Canadensis* the "bluffing" whim seems to come to the surface, and make one think of a flourish about one of the capital letters in nature's penmanship, or "splurge" of paper shirt collar in the attire of a "dude," expressing the sentiment, "Beware of spurious imitations," for "all is not gold that glitters." Then the seemingly superfluous amount of petalism in the Guelder Rose, *Viburnum lantanoides*, and in the Snowball, *V. opulus*, as well as the profuse production of rainbow hues throughout the domains of Flora, and in autumnal foliage tints, leads an observer to surmise that mere utilitarian purposes are not the only ones kept in view by the Omniscient Designer of the universe.

Nov. 24th, 1892.

II.

There are now many indications that the spring season is at hand. Although there was this morning severe frost and a keen, raw northeast air, yet at sunrise the Robins broke out in cheerful song, and the melodious warbling of the Blue-bird seemed continuous. The sights and sounds peculiar to the operations of maple sugar-making are seen and heard on every hand. The past winter was characterized by much snow and cold in its latter half, but I think with less frosty winds than in normal Canadian winters. Decided signs of a relaxation of the cold were manifested during the first week of the present month, and a few Blue-birds appeared near here in the mild sunshine of the 8th, although the snow was at least two feet deep in the woods. Mild cloudy weather continuing, with disposition to fog and rain, Robins made their appearance hereabouts on the morning of the 10th, which is, perhaps, two or three days later than last year's coming of these birds. Although there have been several wintry spells since the middle of the month, the birds have made good their presence in the woods and orchards every day.

The large Meadow-larks were first reported in song on the 17th instant, and have been quite musical almost every day since

that date. Juncos were noticed feeding on the seeds still adhering to the dry culms of the Chenopodium weed on the 13th. Grackles and Kill-deer plovers came on the 13th also, and several large Hawks were observed careering and mewing high above the forest on the 14th. On the 18th the Red-winged Grackle was seen and heard. We have always been accustomed here to liken the sound of the the Red-wing's notes to the pronunciation of the syllables "Pope-ree, pope-ree."

There was a gloomy snow-storm on the 22nd instant, and although three or four inches of snow fell, yet on the weather becoming clement a number of Cranes were seen on the following day. Two parties of Cranes, of four members each, were seen visiting some swamp-ash trees whereon were old nests occupied as breeding-places in past seasons.

The Phœbe Fly-catchers were also reported as having been seen on the same day, but we did not see them until the following morning—the 24th.

A mild wave set in before dawn on the 24th and the thermometer showed 51 degrees at daybreak. At 3 o'clock in the afternoon it reached 60 degrees, and this had an inspiring effect on the birds. The Blue-birds were seen mating, and in search for nesting-places. The Robins were doubly demonstrative in voice and behavior, which subsided somewhat as the atmosphere cooled towards evening, when the wind changed from southwest to northwest. The Song Sparrows have also been contributing their quota almost daily to the bird concert since the 17th.

The Chipmunks were noticed above ground by boys who had their dogs in the sugar bush on the 25th. Ground Hogs' tracks were seen in the snow near their burrows on the 23rd. A reliable observer, however, informs us that he saw a Ground Hog moving about in the snow near its burrow one fine cold day during the last week in February. If this be true it would seem to indicate that this animal, like the bear, awakes from its torpor on Candlemas Day, and if certain meteorological conditions exist, again goes into its retirement for a period of six weeks.

Judging from the promptness of the appearance of the bird-hosts, on the subsidence of the cold weather, it would appear that they travel on the very crest of the warm wave, like a victorious army pursuing and harassing a discomfited and retreating enemy.

Regarding the few Meadow-larks, which winter in these parts, it may be said that a family of these birds has, during the past winter, been located in several hilly-stubble fields and meadows near here. In one of these fields (wheat stubble) there was an immense straw-stack, or rather a slovenly-shaped mound of straw and chaffy seed, covering nearly a quarter of an acre, and in the interstices and cavities of this refuse the birds seemingly found ample food and shelter during the inclement weather of winter, and emerged to give out their well-known notes in the brief intervals and fine days of the cold season. Although these are supposed to be insectivorous birds they have been seen to eat the seeds of some species of grasses, such as timothy and clover, and also, with seeming relish, those of the dandelion and other weeds. The imperfect cultivation of our fields has multiplied the number of weeds, and the annual thistle crop, not to mention numerous other vegetable pests, affords food and nesting material for innumerable birds and small animals.

Since the snow has melted from the fields, great numbers of the neatly-made nests of the Field Mouse are to be seen, especially about the surface of the oat-stubble fields. These nests are like a round ball, and are as large as the two fists of a man. If one takes them to pieces it will be seen that they have been made with much labor and skill. The inner cavity is lined with finely hetchelled grass and straw-fillers; and when one takes into account that all operations have been performed under the deep cold snow, the materials gathered by means of tunnels made to the distance of a number of feet from the intended winter residence, a store of food provided for the many weeks' tenancy, and the cold from above, below and around carefully provided against, he cannot but admire the industry, skill, and foresight of the little architect and builder.

One of our fur-buyers lately made some remarks about the eccentric markings of the Skunk, and stated that there is a great variety in the memphitic markings. In some of them instead of the white V on a black ground, there is a W, with other modifications. Dame Nature seems at times to indulge in a singularly burlesquing mood, as seen in the face markings of the Raccoon, and in its ringed and banded caudal appendage. The curious black diamond-shaped spot on the *chin* of the Chickadee, the white Havelock hood of the black-plumaged Bob-o-link, the white choker of

the owl, and the droll motley markings on the faces of young lambs remind one of the pantomimic rouged, the azure design, and arabesque on the face of the circus clown!

March 28th, 1893.

III.

The pleasant season of spring is now evidently at hand, and we are daily expecting to hear the voice of the plowman with his team in the fertile glebe.

There are still small fragments of the winter's snowdrifts to be seen in northern exposures of shaded fence corners, and people who are at work in the maple sugar bushes assure us that there is yet much frost in the ground, under the fallen leaves of the woods. The Song Sparrows have built their nests in the meadows, as also have some crows. The Phœbe Fly-catchers occasionally fly in at the open door or window of our house in their eager search for a suitable nesting-place. The Hylas were first heard piping on the 24th of March, and now they are quite demonstrative with their chorus in the bog puddles.

The coming of the hardier species of insectivorous birds before the snow of winter has much diminished is a remarkable phenomenon. It is caused, perhaps, by the undue pressure of the bird population in those milder climates to which they resort on the approach of winter. I have been assured by acquaintances, who have wintered in Tennessee and Carolina, that Robins, Grackles, Wood-peckers, Fly-Catchers, and other common species, remained there during the entire year; and it is to be noted here that a few hours of warm sunshine, or a warm south wind setting in at the beginning of March or even late in February, will cause a host of insects to emerge from their winter hiding-places, and these become a source of sustenance to bird life.

So soon as the maples are tapped, and the receiving pails are partly filled with sap, great numbers of dark-colored moths assemble near the oozing fluid, probably attracted by its saccharine effluvium. These and many other two-winged flies, and several species of Hymenoptera, hover constantly about the sap vessels, and are a source of some trouble to the syrup makers. A mere rise of the temperature of the air, say up to 50 degrees of the thermometer, is sufficiently attractive to cause the ornithic wave to flow hither, and thirty or forty hours of warm April sun will bring out the Hepaticas,

which we have occasionally seen expanded, when, on digging about their roots, lumps of frozen earth mould, and even ice, have been found. Last year we saw the first blossoming Hepatica on the afternoon of the 5th of April. The prospects now are that the plant will not be much later this year, as the thermometer to-day indicated 60 degrees, with bright sunshine and southwest wind.

To-day we learn that bees are in active flight, and return to the hive loaded with pollen. An acquaintance suggests that the pabulum was obtained from willow blossoms, but this is an error. The bees have evidently found some blossoming "Skunk Cabbage," (*Symplocarpus Fœtidus*) as their flight was in the direction in which that plant is known to grow abundantly. The small cone-like spathes of this "cabbage" come up at the edge of the bog while there is thick ice within a few inches of the spot. The plant mentioned is of the Arum family and each flower when magnified shows four stamens. The willows come next, or nearly so, in furnishing a supply of bee food. It is thought here that bees have wintered with much less than the usual percentage of loss.

It makes quite a difference what one sees in a series of objects. The more the mind is trained to observe, the more one sees in objects and their surroundings.

Dr. Holmes well observes: "Nature plays at dominoes with you; you must match her piece, or she will never give it up to you." Mr. Emerson says: "It is so wonderful to our neurologists that a man can see without his eyes, that it does not occur to them that it is just as wonderful that he should see with them; and that is ever the difference between the wise and the unwise: the latter wonders at what is unusual. The wise man wonders at the usual! Shall not the heart which has received so much, trust the Power by which it lives? May it not quit other leadings, and listen to the Soul that has guided it so gently, and taught it so much, secure that the future will be worthy of the past?"

April 4th, 1893.

IV.

Last Monday morning, the 17th, a neighbor found a Wildcat caught by one of its forefeet in a large steel trap that had been set and baited with a dead hen, on the margin of an extensive cedar swamp about two miles from here. I went to look at the strange creature a few hours after its capture, and was informed that the

brute weighed only a little over eighteen pounds. It was a male, and spare in flesh. The body was of a tawny grey color, with very faint shadows of stripes on the sides, and small leopard-like specks of black on a tawny ground on the inside of the legs. The tail appeared to be four or five inches only in length, and near the tip there was a black ring of about an inch wide, and at the extreme end a tuft of white hairs. The teeth seemed as large as those of an ordinary bull-dog, and the animal had gnawed in two, near the roots, the stems of one or two poplar trees as thick as a man's wrist, which grew near the trap. The feline was held for eight or ten hours before its life was ended by a bullet. Tracks of wild-cats have been noticed in the snow in the same swamp occasionally of late years, but no similar capture has been made during the last twenty years. The animal will be stuffed and mounted.

The drumming of the Ruffled Grouse has been frequent about here, and the notes of the Chewink became noticeable about the same date, the 6th April. Several Golden-winged Wood-peckers were seen during Easter Week. A friend reports that he has frequently met with these birds in the bush this year since the 17th of March.

On Monday I saw several groups of Grackles enjoying themselves near the small pools of water in the fields. They come to such spots to capture Caddis worms and other aquatic larvæ. So soon as the party have fished a puddle out, they ascend to the branches of the nearest tree and have a chorus of song, at the conclusion of which they fly to a fresh puddle, and repeat the programme.

When the flock numbers forty or fifty the musical effect is harmonious and pleasing, but when there happen to be ten or a dozen only in the party, the discord of individual notes mars the harmony. These Grackle serenades discontinue when the birds pair and commence nest building, which generally takes place about the 1st of May.

On Monday, the 17th, between 11 and 12 a. m., I heard the whiffle-waffling sounds made in the air by the Snipes. At this time of the spring it is a peculiar, soft, genial sound, and is mostly heard near the margin of bogs about the hour of gloaming, and onward to midnight in the warm, calm evenings of the last of April. Occasionally, however, the music is given forth at mid-day, especially if the weather be calm and cloudy, as on Monday last. I cannot do better than quote from Mr. Bolles' book, "A Stroller in New England," concerning this phenomenon:

"At ten minutes to eight, in the evening, (17th Mar., 1891), the air resounded with the strange music of the flying snipe. My friend, who has heard this sound scores of times, feels confident that it is mechanical in character; 'drumming,' in fact. To my ears, it seems to be vocal in quality. Whichever it may be, its weird sweetness makes it one of the most attractive night or twilight sounds in nature. * * * For the shy recluse of the swamp to betake himself at evening to the heights of the sky, and there, against the stars—invisible to all except the keenest eyes—to produce his witching serenade, is something unique and captivating to the imagination."

Those who have watched and heard them at mid-day tell me that they circle about at an altitude of 250 or 300 feet, and make the sound mentioned at intervals of from one to two minutes. My informants believe the sound to be produced by the bird's wings. On Monday last I could point to the spot whence the sounds proceeded, and the birds moved from sixty to seventy feet between the giving forth of the sounds. Whether I had disturbed the birds or not in their feeding operations I am unable to say, but the sounds continued as long as I remained on the spot—from seven to eight minutes. I believe the sound to be produced by the snipe's voice. These birds rarely remain here more than a week or ten days, which is at the end of April.

The first Hepatica flowers were found here on the 8th instant. Dragon Flies were seen on the 13th. Five inches of snow fell on the morning of the 15th. To-day an icy rain is falling.

April 20th, 1893.

V.

This is a somewhat tardy spring. I can find no *Sanguinarias* that have yet opened their flowers in spots where in twelve or fourteen days they will be plentiful. There has been a slight snowfall this morning, but it all melted in an hour or two. A Robin is diligently setting on her nest of eggs in a grape vine in my garden, yet I have neither seen nor heard of the arrival of the Swallows. They were seen in Burford last year for the first time on Easter Sunday, 17th of April.

The leaves of the *Erythronium* are nearly expanded in the forest places. *Scilla Siberica* and the English Primrose flowers have beautified our flower plot for the past two weeks.

On Easter Sunday (2nd inst.) one of our neighbors' sons found a pair of common garter snakes fulfilling the sexual instinct just out-

side of the entrance of their winter retreat on a sunny knoll. In this amorous procedure the snakes twist around each other like a piece of thick cord. In the present instance the ophidians were killed by the dog which attended the boy. Dogs need very little encouragement to kill common snakes. The first business of all the reptilia on their revival in spring, as well as that of the majority of the warm blooded quadrupeds that hibernate, is *sex association*, for the purpose of continuing their kind, and on the first warm sunny days, even in the last days of March or the first week in April, it is a common incident here to find garter snakes as above indicated, even when large snowdrifts can be seen wasting away near the sheltering hole or log.

In the warm nooks among dry fallen leaves in the woods the Hepatica flowers were by no means scarce previous to the five inches of snow-fall last Saturday, the 15th inst., but they have made very little progress since, as the weather has been chilly and uncongenial ever since, with the exception of, perhaps, one day, Tuesday last, 18th inst.

The little chestnut-headed Sparrow (*Fringilla porsilla*), who now have nests in the shrubberies, and also the Juncos, seem in consternation at the way the wind blows and the snow flakes fly this morning, yet the Meadow-larks sing lively in the intermittent glints of sunshine, and some of the Robins are working vigorously at the job of digging out angle worms from the sod or sward in the orchard. Thermometer 41°.

April 21st, 1893.

VI.

At the date of my epistle of the 20th ult., I had not heard of the presence of Swallows, yet two or three were said to have been seen here next day (21st ult.) by an acquaintance, upon whose word I place reliance. A more numerous group of thirteen were noticed on the 25th of April by my son. They were perched close in a row on the railroad telegraph wire, in a shaded place between tall woods, and rested there for some time, seemingly fatigued, as if recent arrivals from a warmer latitude. The same species of birds have gradually become more numerous since that date, and are now hourly to be seen and heard twittering and flying in and out of our barn and outbuildings.

The weather continues rather uncongenial, and the month of April, 1893, will long be remembered as remarkable for its boisterous

winds and paucity of sunny calm days. Vegetation is backward, the forests as yet showing but little change from their wintry bareness and indecisive tints, excepting, perhaps, the swamp maples, which reddened with blossoms two weeks ago.

I noticed a few dandelions in blossom for the first time this year on Wednesday last (26th of April.) They are generally to be seen two weeks earlier. I have seen the same flowers expanded in England by the 15th of April. The temperature went up a little on the 30th of April, and consequently the House Wrens put in their appearance. We heard their rippling chant before 7 a.m., announcing their punctual return to their familiar summer quarters. A pair of them went bustling about the neighborhood the whole day, pouring forth volubly repeated snatches of song.

The birds had probably crossed Lake Erie, from Pennsylvania, the same morning, as an acquaintance who lived for years in the Long Point region, avers that migratory birds are frequently at this time of the year, seen there, at, or before sunrise, that were absent at dusk of the previous day.

The leader in the arrival of the warbler family is almost always the little Red-start (*Setophaga ruticilla*), which appears simultaneously with the house Wren, followed immediately by the Marland Yellow-throat, and the Blue-Eyed Yellow Warbler. The Humming Bird is first seen here as soon as the currant bushes blossom. The Robins, that were ten days ago setting on their nest of eggs in the branches of a grape vine in my garden, have met with misfortune, and the broken egg shells are now lying under the nest, which is deserted. I have no doubt that this havoc has been the work of the Boat-Tailed Grackle, which in parties of two and three daily visit the garden, evidently on evil deeds intent. In future it will be more dangerous for them to appear within gunshot of our house premises. This bereavement of the Robins brings to memory a bit of sentimental writing in the New England Stroller, ("*Land of the Lingering Snow*,") which seems worth quoting, (locality Beaver Brook.) "In this meadow the Marsh Marigolds were abundant (May 9th), but on seeking to gather a bunch, I felt the first sorrow of the year. The flowers were faded, their golden petals were stained and partly fallen, *their beauty had departed.* So soon! Spring, scarcely sure of its standing as a season, is marked with the first scars of death. Not far away I saw

a dandelion gone to seed. Truly if the winter is tempered by many a suggestion of the renewal of life, the spring is branded with many a reminder of the coming of death. Life and Death, what are they but the swinging of a pendulum,—the one as sure to succeed the other, as the other is certain to give place to the one. Each, while it lasts, contains an ever increasing germ of the other. Neither can be *final* as long as the law exists."

Mr. Bolles is a very graphic writer, and his descriptions abound in poetic similitudes, and striking philosophic analogies.

An hour's walk in the woods on a May morning revealed an interesting page in the year book. The increase of heat does not seem *creative*, for in the animal and vegetative life there is *periodicity* —that takes time by the forelock—anticipates, as it were, time and seasons, which are only *co-ordinate*, for when the Ground Hog's hibernating nap of five months is finished, he arises,* shakes himself, and meets the day.

The Robin in his matin song anticipates the coming of daylight; yestermorn he began his canticle when near objects could only be indistinctly seen by human eyes, and the Wren and Pewit Flycatcher speedily followed suit.

The woodland flowers are belated this year, but they had made every preparation to jump into being, and by the time that the thermometer had risen to 60 degrees at noon of the 1st of May, the *Sanguinarias* and *Claytonias* had opened their blossoms, and the *Dicentras* and *Erythroniums* had shot and extended their flower stems and formed incipient flowers.

In bird life almost every hour announces a new arrival. The Large Flycatcher's (*Myiarchus crinitus*) coarse note resounded through the forest this morning, and not far off, the precipitating notes of the Winter Wren were echoed back, and on moving on into the forest depths, the peculiar notes of the Golden-crowned Thrush met the ear. He sang quite timidly at first, as if fearing to be thought intrusive, like a novice in the art of oratory making his debut, yet not quite sure of a favorable reception. Then immediately afterwards, on coming to the forest margin, the rapid song of the Purple Linnet was heard for the first time since last July. This bird is now a laggard; many times we have heard his song during the first week in April.

*Their orbit is co-relative with the calendar.

There was a Crow's nest on a large tree in a not far distant part of the bush, and sounds were distinct and frequent, as if the old birds were feeding the young *corvines*, but my son mentions that several years ago, he, on hearing similar sounds under similar conditions, was at the trouble to chop down a large tree, ere he made the discovery that the nest had only contained eggs, and that the sounds of food being greedily swallowed proceeded from the throat of the setting hen crow, who was being indulgently fed by her consort.

The early spring flowers will nearly all blossom together this spring, coming "in a lump," one may almost say. The Cohosh, Violets, Trilliums and Acteæs have all to blossom during the next three weeks, or else be eclipsed by the big tree foliage, under whose dense shade they soon dwindle.

This must be the rainy monsoon, and farmers are incommoded by the frequent rains, which have stopped all tillage for the present. Clover fields are now beginning to hold out prospects of pasturage if there should be few recurrences of night frost.

There has been distant thunder to-day, and it may be recorded that violent thunderstorms have been of more frequent occurrence than usual, ever since the middle of the month of February. Thunder squalls in spring are believed to be, by the average farmer, succeeded by abnormally cool weather, and the experience of this season may strengthen the dogma.

April 29th, 1893.

VII.

Last evening, by twilight, a number of Whip-poor-Wills gave us their quaint serenade, with its old time emphasis. Their aversion to the mythical "Will o' the Wisp," judging by the birds' vehement objurgations, is by no means diminished.

The first ornithic sounds that greeted the ear on going forth this morning were the staccato notes of the Bobolink, and the pathetic pleading of the Hermit Thrush.

I heard the sound of flying Snipes in the gloaming of 24th April, at another spot. This is a correct description from Mr. Bolles' book: "Rising to a considerable height above the meadow, they fly with rapid wing beats over it, round and round, making from time to time a series of short notes similar to those produced by a person blowing in a rapidly intermittent way across the mouth of a

small shallow bottle. Whether this noise is vocal or mechanical in character, the bird controls it, and *stops it without stopping its flight.* This evening the birds, as a rule, seemed satisfied with twenty-five or thirty successive notes in a series, about once a minute."

Fringilla Tristes (the Yellow Hemp Bird) put in an appearance on the 1st inst., and I saw the *Carex Plantaginea* in blossom to-day.

May 2nd, 1893.

VIII.

The spring season seems to have earnestly set in at last after many relapses. A New England author, whose treatise I have lately been reading, ("The Stroller in New England" by Frank Bolles) describes the spring season's movements as "Crab-like," yet with many charms, and terms that season of the year "The Maidenhood of Nature."

The bush flowers are ten days to two weeks late this year. I saw the first "Adder Tongues" (*Erythronium Americanum*) in full blossom last Thursday. There was a handsome patch of unusually large ones growing on rich ground among raspberry bushes, which had given them shelter and protection. These flowers, if well cared for, seem capable of much enlargement and improvement.

The Marsh Marigolds began to open yesterday, and will soon be at the height of their beauty and vigor. This year they are about co-temporaneous with the Trilliums which began to expand on Saturday and on Sunday (6th and 7th.)

A large number of the summer birds are now here. The Cat Bird, Thrush, and the Hermit Thrush can be heard every day, in full song, and many of the small warblers, notably the pretty Red Start Flycatcher and others. The Tyrant Flycatchers and the Chimney Swallows have also been noticed for some days, and the serenades of the Whip-Poor-Wills, we hear in a piece of not far-distant woods almost every night. When three or four of these strange birds hold a sort of a seance in the loneliest part of the forest, on bright moonlight nights, the drama is a most fantastic extravaganza. They frequently take up triangular positions, or perhaps roughly, quadrangular. Number one will give his quaint call eighty or ninety times in quick succession; on his ceasing number two begins his recitative of about the same number of syllables; next number three "takes up the wondrous tale," and so on about, with brief intervals of moth-catching, till break of day. Sometimes if number one

monopolises more than his due share of the serenade, number two loses all patience and strikes in hit or miss, and the jumble sounds odd, a sort of bird-Billingsgate, for toward the last of his series of "whip-poor-wills," the party of the first part accelerates his rate, and repeats the triad with almost breathless rapidity, so as to get in his number and make sure of his time ahead of interruption. There is something romantic, and almost dreamy and somnambulistic, so remote from the huckstering world of our day, in these midnight bird-revels, that when we listen to them we are carried in memory to the "Arabian Nights Entertainment," or to some of the episodes in the Decameron of Boccaccio, and "Night is Palace Beautiful Peace Chambered," and at that period of the year when the air is swarming with fire-flies the carnival is at its climax!

The "Renaissance" or true growing-time seems now to have arrived, and summer-sounds like the call of the Oriole and the flute of the Rose-breasted Grosbeak are heard, and man and beast rejoice.

The thermometer stands 69 degrees in the shade. Least Sandpiper's cries are frequent, both by day and in the evening. They have nests in our meadows.

May 9th, 1893.

BALLADS AND BALLAD LITERATURE.

Read before the Hamilton Association, December 22nd, 1892.

BY H. B. WITTON.

With almost all peoples, ballads and rude poetry furnish the oldest fragments of history. Buckle, the historian, says: "All history is at first ballads." Besides their contributions to history, songs have helped to inspire national bravery, and in a variety of ways have made men happy and useful. The Norsemen had their Skalds; the Latin races their trouveres, troubadours, jougleurs and minstrels; the Germans had their minnesingers and meistersingers; and the Britons and Celts their gleemen and bards. Maistre Wace, who lived in the middle of the XII century, has left an imaginary description of the various poets who took part at the coronation of King Arthur. His is an interesting picture of a medieval minstrel company. His "idle singers of an empty day" he classifies into "jougleurs, singers and rhymers," and adds; "many songs might "you hear, rote songs, vocal songs, fiddler's lays and notes, lays for "harps, lays for sytols, lyres and corn pipes, symphonies, psalteries, "monochords, cymbals. Of performers there were plenty, male "and female, and some said tales and fables."

At festivals, public and private, the minstrel was an important personage. In the Gothic hall of the noble his harp and voice were ready with stories ofttimes told, but ever new, of knightly bravery in battle, and devotion in love; while at more public gatherings such as the visitation of a bishop, the installation of an abbot, or above all, at the coronation of a king, national themes became the burden of his song. But the minstrel was as much at home, and was as welcome in the cottage of the peasant as in the hall of the baron. A fragment from "Chevy Chace," some of the exploits of Robin Hood, or a minor ditty of local bravery, love, devotion or suffering, sufficed to make all listeners akin, and assured the minstrel a welcome wherever he went. Chaucer's picture of the minstrel of his time is realistic and evidently from the life:

"Somewhat he lisped for his wantonness
"To make the English sweete upon his tongue;
"And in his Harping when that he had songe,
"His Eyen twinkled in his Head aright,
"As don the Sterres in a frosty night."

In the middle ages minstrels were often well rewarded. The Chroniclers record that some of them built churches and founded religious houses. Their attractions sometimes excited the clergy to jealousy; for in the olden time many liked songs better than sermons, and preferred to be pleased than instructed.

Of the pre-Christian, heathen literature of Britain, time has left but little trace. The ordeal of modern criticism has reduced the heathen remains of the Celtic period to a few fragments. "Beowulf," an Anglo-Saxon poem of the VIII century, is, in spirit, more Christian than heathen. The "Traveller's Song," which is assigned to the latter half of the VI century, recites the poet's experiences as a travelling gleeman. Another piece "Deor's Complaint," which is held to be of about the same age, is the lament of a bard whom another had supplanted in his lord's favor. The scholarship of England in Anglo-Saxon times was practically confined to the clergy, and the literature of that period is characteristically religious. Translations and paraphrases of the Gospels and narrative portions of the Scriptures, homilies, pastorals, legends, and annals, and chronicles by monastics, are the chief treasures bequeathed to posterity by writers of the middle ages. An interesting list of the best writings of that time, and a summary of their contents may be found in Ten Brinks History of English Literature.

Ballads were originally dancing songs; but, as now understood, they are lyrical poems, in which some popular story is pointedly told. A ballad may, indeed must, include sentiment or passion, or both; but it is essential for these to be coupled with succinct graphic narration of outward action. Sentiment and passion, unaccompanied by narrative, when poetically expressed, fall under some of the infinite varieties into which songs of war, sentiment, and love, and religious hymns may be subdivided, rather than to ballad poetry.

Many of the older ballads of our collections have been orally handed down, till recent times; and nobody knows their exact age or authorship. There is indeed a growing belief that the vital por-

tions of some of the great ballads, like the essential forms of many popular marchen, fables, and nursery rhymes, have been roving about the world for ages, like the wandering Jew, and are the common inheritance of many peoples. The comparative method of investigation applied to popular stories shows some tales to be veritable cosmopolites, strangers nowhere; and the same method applied to the study of popular ballads, may have much to teach concerning them. But it is not strange that folk-poetry even in countries far apart should have lineaments, and strong points in common. Human hearts throb with like passions under different skies. Good and evil, joy and sorrow, love and hate, temptation and self-abnegation, the unspeakable beauty of the earth below, and the heavens above, these—the ultimate elements of all poetry—are common to all lands and ages.

Although the exact date of the older ballads cannot be determined, some of them are undoubtedly closely related to the *lais*, metrical romances and fabliaux, which came into vogue in England, soon after the Norman conquest. These romances, first in verse, and afterwards in prose, dealt with a variety of subjects, legendary and actual, amongst which were the exploits of Alexander the Great; the fall of Troy; the legends of King Arthur; and those of the Holy Grail. These, and many similar topics, during the eleventh and twelfth centuries, were written in metrical form, and in the thirteenth and fourteenth centuries they were reduced to prose, and re-arranged in many shapes. Some of these romances are veritable art treasures; they were written in monasteries, and years of labor were bestowed on their initial letters, miniatures and decoration. Specimens of these manuscripts are still preserved. They are jealously guarded in the great libraries of the world, not only for their rarity, but for the influence of such romances on the literature of Europe, and on the system of chivalry which dominated what was best in Europe for some centuries. Several of these romances were printed by the early printers. Caxton both translated and printed the "Historyes of Troye," and Sir Thomas Malory prepared for Caxton's press a book of the Arthurian legends, which in our own time have been presented to the world anew with such melodious freshness by Tennyson.

At its date of issue, in 1765, and for some time after, the book entitled "Reliques of Ancient English poetry," published by Thos. Percy, was the best collection of ballads known. Percy was a man of literary tastes, who enjoyed the friendship of Garrick, Johnson, Shenstone, and other men of note in his day. For a quarter of a century he was rector at Easton Maundit, a village near Nottingham, and afterwards, by favor of the Duke of Northumberland, he became Bishop of Dromore, the see once held by Jeremy Taylor. That Percy had qualifications for making a good collection of ballad poetry, may be seen from his own song, commencing:

"Oh, Nancy, wilt thou go with me
"Nor sigh to leave the flaunting town?
"Can silent glens have charms for thee
"The lowly cot and russet gown?"

Burns said of that song: "It is perhaps the most beautiful ballad in the English language." The first edition of Percy's book contained 176 pieces, 45 of which were taken from an old written ballad book. That old manuscript, since become famous, was a long, narrow, folio volume, containing 195 songs, ballads, and metrical romances. Percy found it on the floor at a friend's house. He was just in time to save it from destruction, as the servants had begun to use it for lighting the fire. After Percy's death, it passed into the possession of his son-in-law, and in 1868 was bought for the British Museum, where it remains. The handwriting of the old ballad book is held by experts to be of the time of the restoration. Mr. Furnival, the great authority on such questions of English literature, calls it "The foundation document of English balladry." In conjunction with Mr. Hales, Mr. Furnival in 1867-68 printed the manuscript in full. Sir Walter Scott acknowledged his obligation to Percy's Reliques, and their influence on his tastes and pursuits. He says: "The first time I could scrape a few shillings together I bought a copy of these beloved volumes; nor do I believe that I ever read a book half so frequently, or with half the enthusiasm."

Shortly after the Reliques were printed for Percy, Joseph Ritson published his "Ancient Songs and Ballads." Ritson's book, though printed in 1787, and dated 1790, was not published until 1792. It is a collection of ballads, chronologically arranged, from the time of Henry the Second to the Revolution; and is edited with great care. Ritson made no pretension to genius, as that gift is usually explained, but by the

special definition, according to Carlyle, that "genius is the capacity to take infinite pains," he was a genius of good standing, for few men ever took more pains to do accurate work than he did. But like some men of that stamp, he had a perverse temper, and took an almost impish delight in pointing out the petty inaccuracies of other workers in the same field of labor as his own. Scott appreciated Ritson's exact knowledge, and careful work, and rarely disagreed with him, though a story is told, that Ritson, when a visitor at Scott's house, on one occasion became so aggressive that Leyden, despite his fondness for literature, could stand the irritation no longer, and threatened to "thraw Ritson's neck," and pitch him out of the window. Despite imperfections of temper, which in his later life became a grave affliction, Joseph Ritson is entitled to the thanks of all who take pleasure in the antiquities of English literature.

Since Ritson's day, Scott, Motherwell, Aytoun, Lockhart, Jamieson, Chambers, and others, have edited collections of ballads, and numerous British societies have printed for their members, ballads of particular periods. Scott's collection of border ballads was just in time to save many of them from oblivion, as their oral transmission was then confined to a few old people, and the next generation would have known little or nothing of them. The completest collection of old ballads is that edited by Prof. F. J. Child, of Harvard University. The Ballads, in 4 vols., edited some years since by Prof. Child, for the Boston edition of the British poets, made lovers of ballad literature his debtors, and the limited edition in 10 parts, just completed under his care, is a superb work, quite unrivalled of its kind.

If the modern ballads, which have permanently enriched the literature of the nineteenth century, be added to those of earlier date, ballad literature becomes doubled in volume, and not depreciated in quality. The poets of Germany following in the footsteps of their forbears, have turned the genius of their language and predilections of the Teutonic race to account, in producing ballads of unsurpassed beauty, and most of the English poets of later years have added to the value of the hoard.

Many a garland might be strung from the beauties of ballad poetry. The limits of this paper permit only a flower or two to be plucked here and there. As with Sinbad in the valley of diamonds,

the difficulty is to choose from such abundance. In such a case we may forbear to quote in order of time or subject. The bee flits from blossom to blossom, and gathers honey, regardless of the order of his visitations, and our illustrations may be more pleasing from variety than from formal selection.

The Cuckoo song is said to be the oldest song in the English language. Ritson places it third in chronological order in his list, and neither of the two which precede it is in English. The Latin convivial song of Walter Mapes stands first, and the second is the French song by Richard the First, written during his captivity in Germany on his return from the East. The MS. of the Cuckoo Song is in the British Museum, and is referred to the year 1250. Although not within the pale of ballads proper, its beauty and age both claim for it first place in English Lyric poetry.

Summer is y-comen in,
    Loud sing, cuckoo ;
    Groweth seed,
And bloweth mead
And spring'th the wood now
    Sing cuckoo !
Ewe bleateth after lamb,
Low'th after calf cow,
    Bullock sterteth,*
    Buck verteth,
    Merry sing cuckoo !
    Cuckoo, cuckoo !
Well sings thou, cuckoo !
Nor swike† thou never now.

The best known of the old ballads is that called Chevy Chase. There are several ballads, some English, others Scottish, concerning battles on the border. The only fight in which a Douglas fell when battling with a Percy, was that of August 9th, 1388, at Otterburn, where the Earl of Douglas was slain on the field. In the ballads, victory is claimed for both sides, according to the national predilection of the singer. Froissart, the French chronicler, says the Scots were victorious. Chevy Chase is in an ancient and modern version, both of which are more recent than the Otterburn ballads. The minstrel opens with a hunting foray, which is soon merged in the battle given in the older ballads. But, anachronisms are no rarities in these old songs, and historical accuracy is

* gambols † cease

not to be expected. The modern version of Chevy Chase, if less accurate than the older songs, is an admirable ballad. Every incident of the day is fixed in the memory, never to be forgotten. The meeting of the armies, the death of Douglas, and the roll call after the battle, are described with much force. How gruesome is the picture of the scene after the fight:

> "Next day did many widows come,
> Their husbands to bewail;
> They washed their wounds in brinish tears,
> But all would not prevail.
>
> Their bodies bathed in purple blood
> They bore with them away;
> They kissed them—dead—a thousand times,
> When they were clad in clay."

Of modern ballads Lenore by Burger is a masterpiece. Its reputation has long been world-wide; and Germany prizes it as the ballad of ballads. The birth of the modern ballad in Germany dates from its production. Burger wrote this celebrated piece in 1773, eight years after the publication of Percy's Reliques. With a firm hand Burger has pictured the old heathen belief that love is stronger than death, inasmuch as even the rest of the dead may be broken by grief of the living. And with like skill he shows the sinfulness of murmuring or despairing over the dealings of Providence with men. The sources of Burger's ballad, are "Sweet William's Ghost," an ancient ballad given by Percy; an old German *volkslieder*, and a tale told him by a peasant girl—of a phantom trooper, who at midnight bore to his grave his disconsolate sweetheart. These suggested Lenore to Burger, as Bandello's novel suggested Romeo and Juliet to Shakespeare. In both cases outlines of the story were to hand, but they were only the motive stimulating the master's higher art, the crude elements to be transmuted to gold in the alembic of the poet's imagination. Dramatists, musicians and painters, have been attracted by this ballad, and have made their arts minister to illustrating its weird beauty. Sir Walter Scott translated it into English in 1795, and it was published the following year under the name of "William and Helen." Scott's attention was drawn to the ballad by the chorus of the midnight ride, by which the flight of the spectral steed is made so realistic that it can be almost heard. Taylor's translation of that stanza was repeated to Scott, who used nearly the same words in his version, informing

his readers that for doing so he "had obtained forgiveness of the gentleman to whom the chorus properly belongs." The original chorus reads:

Und immer weiter, hopp, hopp, hopp!
Ging's fort in sausendum Galopp,
Das Ross und Reiter Schnoben
Und Kies and funken stoben.

The translation Scott heard reads:

Tramp! tramp! across the land they speed,
Splash! splash! across the sea;
Hurrah! the dead can ride apace!
Dost fear to ride with me!

Scott's own translation in full is:

From heavy dreams fair Helen rose,
And eyed the dawning red;
"Alas, my love, thou tarriest long!
O, art thou false or dead?"

With gallant Fred'rick's princely power
He sought the bold Crusade;
But not a word from Judah's wars
Told Helen how he sped.

With Paynim and with Saracen
At length a truce was made,
And ev'ry knight return'd to dry
The tears his love had shed.

Our gallant host was homeward bound
With many a song of joy;
Green waved the laurel in each plume,
The badge of victory.

And old and young, and sire and son
To meet them crowd the way,
With shouts and mirth and melody,
The debt of love to pay.

Full many a maid her true love met,
And sobb'd in his embrace,
And flutt'ring joy in tears and smiles
Array'd full many a face.

Nor joy nor smile for Helen sad;
She sought the host in vain;
For none could tell her William's fate,
If faithless, or if slain.

The martial band is past and gone;
She rends her raven hair,
And in distractions bitter mood
She weeps with wild despair.

"O rise, my child," her mother said,
"Nor sorrow thou in vain;
A perjured lover's fleeting heart
No tears recall again."

"O, mother, what is gone is gone !
What's lost forever lorn ;
Death, death alone can comfort me ;
O had I ne'er been born !

"O break, my heart, O break at once !
Drink my life-blood Despair !
No joy remains on earth for me,
For me in heaven no share."

"O enter not in judgment, Lord !"
The pious mother prays ;
"Impute not guilt to thy frail child !
She knows not what she says.

"O say thy pater noster child !
O turn to God and grace !
His will that turned thy bliss to bale,
Can change thy bale to bliss."

"O mother, mother, what is bliss ?
O mother, what is bale ?
My William's love was heaven on earth,
Without it earth is hell.

"Why should I pray to ruthless Heaven,
Since my love, William, 's slain ?
I only pray'd for William's sake,
And all my prayers were vain."

"O take the sacrament, my child,
And check those tears that flow ;
By resignation's humble prayer,
O hallow'd be thy woe !"

"No sacrament can quench this fire,
Or slake this scorching pain,
No sacrament can bid the dead
Arise and live again.

"O break, my heart, O break at once !
Be thou my god, Despair !
Heaven's heaviest blow has fallen on me,
And vain each fruitless prayer."

"O enter not in judgment, Lord,
With thy frail child of clay !
She knows not what her tongue has spoke
Impute it not, I pray !

"Forbear, my child, this desperate woe,
And turn to God and grace ;
Well can devotion's heavenly glow
Convert thy bale to bliss."

"O mother, mother, what is bliss ?
O mother, what is bale ?
Without my William what were heaven ?
Or with him what were hell ?"

Wild she arraigns the eternal doom,
  Upbraids each sacred power,
Till spent, she sought her silent room
  All in the lonely tower.

She beat her breast, she wrung her hands,
  Till sun and day were o'er,
And through the glimmering lattice shone
  The twinkling of the star.

Then crash ! The heavy drawbridge fell,
  That o'er the moat was hung ;
And clatter ! clatter ! on its boards
  The hoof of courser rung.

The clank of echoing steel was heard,
  As off the rider bounded ;
And slowly on the winding stair
  A heavy footstep sounded.

And hark ! and hark ! a knock—tap ! tap !
  A rustling, stifled noise ;
Door latch and tinkling staples ring ;
  At length a whispering voice.

" Awake, awake, arise, my love !
  How, Helen, dost thou fare ?
Wakest thou, or sleep'st ? Laugh'st thou or weep'st ?
  Hast thought on me, my fair ?"

" My love ! my love ! so late by night !
  I waked, I wept for thee :
Much have I borne since dawn of morn ;
  Where, William, could'st thou be ?

" We saddle late—from Hungary
  I rode since darkness fell ;
And to its bourne we both return
  Before the matin bell.

" O rest this night within my arms,
  And warm thee in their fold !
Chill howls through hawthorn bush the wind,
  My love is deadly cold."

" Let the wind howl through hawthorn bush !
  This night we must away ;
The steed is wight, the spur is bright ;
  I cannot stay till day."

" Busk, busk and boune ! Thou mount'st behind
  Upon my black barb steed :
O'er stock and stile, a hundred miles,
  We haste to bridal bed."

" To-night ! to-night a hundred miles ?
  O dearest William, stay !
The bell strik'st twelve—dark dismal hour !
  O wait, my love, till day !

"Look here, look here, the moon shines clear,
Full fast I ween we ride,
Mount and away! for 'ere the day
We reach our bridal bed.

"The black barb snorts, the bridle rings;
Haste, busk and boune, and seat thee;
The feast is made, the chamber spread,
The bridal guests await thee."

Strong love prevail'd; she busks, she bounes,
She mounts the barb behind,
And round her darling William's waist
Her lily arms she twined.

And hurry! hurry! off they rode,
As fast as fast might be,
Spurned from the courser's thundering heels
The flashing pebbles flee.

And on the right, and on the left,
'Ere they could snatch a view,
Fast, fast each mountain, mead and plain
And cot and castle flew.

Sit fast, dost fear? The moon shines clear—
Fleet goes my barb, keep hold!
Fearest thou? "O no," she faintly said;
"But why so stern and cold?

"What yonder rings? what yonder sings?
Why shrieks the owlet grey?"
'Tis death-bell's clang, 'tis funeral song,
The body to the clay.

"With song and clang, at morrow's dawn,
Ye may inter the dead;
To-night I ride with my young bride
To deck our bridal bed.

"Come with thy choir, thou coffin'd guest,
To swell our nuptial song.
Come priest to bless our marriage feast,
Come all, come all along!"

Ceased clang and song, down sunk the bier;
The shrouded corpse arose;
And hurry! hurry! all the train,
The thundering steed pursues.

And forward! forward! on they go;
High snorts the straining steed;
Thick pants the rider's labouring breath
As headlong on they speed.

"O William, why this savage haste?
And where thy bridal bed?
'Tis distant far, low, damp and chill,
And narrow, trustless maid.

"No room for me?" "Enough for both;
Speed! speed! my barb, thy course!"
O'er thundering bridge, through boiling surge,
He drove the furious horse.

Tramp! tramp! along the land they rode,
Splash! splash! along the sea,
The scourge is wight, the spur is bright,
The flashing pebbles flee.

Fled past on right and left how fast
Each forest, grove and bower!
On right and left fled past how fast
Each city, town and tower!

"Dost fear? Dost fear? the moon shines clear,
Dost fear to ride with me?
Hurrah! hurrah! the dead can ride!
"O William, let them be!"

"See there! see there! What yonder swings
And creaks 'mid whistling rain?"
"Gibbet and steel, th' accursed wheel;
A murderer in his chain.

"Hello! thou felon, follow here;
To bridal bed we ride;
And thou shall prance a fetter dance
Before me and my bride."

And hurry! hurry! clash, clash, clash!
The wasted form descends,
And fleet as wind through hazel bush,
The wild career attends.

Tramp! tramp! along the land they rode,
Splash! splash! along the sea;
The scourge is red, the spur drops blood,
The flashing pebbles flee.

How fled what moonshine faintly shewed!
How fled what darkness hid!
How fled the earth beneath their feet,
The heaven above their head!

"Dost fear? dost fear? the moon shines clear,
And well the dead can ride;
Dost faithful Helen fear for them?"
"O leave in peace the dead!"

"Barb! barb! methinks I hear the cock;
The sand will soon be run;
Barb! barb! I smell the morning air,
The race is well-nigh done."

Tramp! tramp! along the land they rode,
Splash! splash! along the sea;
The scourge is red, the spur drops blood,
The flashing pebbles flee.

"Hurrah! hurrah! well ride the dead;
The bride, the bride is come;
And soon we reach the bridal bed,
For Helen, here's my home."

Reluctant on its rusty hinge,
Revolved an iron door,
And by the pale moon's setting beam
Were seen a church and tower.

With many a shriek and cry whiz round,
The birds of midnight, scared,
And rustling like autumnal leaves
Unhallow'd ghosts were heard.

O'er many a tomb and tombstone pale,
He spurr'd the fiery horse,
Till sudden at an open grave
He checked the wondrous course.

The falling gauntlet quits the rein,
Down drops the casque of steel,
The cuirass leaves his shrinking side,
The spur his gory heel.

The eyes desert the naked skull,
The mould'ring flesh the bone,
'Till Helen's lily arms entwine
A ghastly skeleton.

The furious barb snorts fire and foam,
And with a fearful bound,
Dissolves at once in empty air,
And leaves her on the ground.

Half seen by fits, by fits half heard,
Pale spectres flit along,
Wheel round the maid in dismal dance
And howl the funeral song.

"E'en when the heart 's with anguish cleft,
Revere the doom of heaven;
Her soul is from her body reft,
Her spirit be forgiven!"

A writer of ballads pitched in a different key, but worthy to rank with Lenore in excellence, was Macaulay. It is now half a century since his Lays of Ancient Rome first appeared. Their brilliant author was then at his best as essayist, reviewer and orator. His old antagonist, Prof. Wilson, of Edinburgh, gave them in "Blackwood" a hearty greeting. "What!" he says. "Poetry from Macaulay? Ay, and why not? The House hushes itself to hear him even though Stanley is the cry! If he be not the first of critics (spare our blushes) who is? Name the young poet who could have written the Armada. The young poets all want fire; Macaulay is

full of fire. The young poets are somewhat weakly ; he is strong. The young poets are rather ignorant ; his knowledge is great. The young poets mumble books ; he devours them. The young poets dally with their subject ; he strikes its heart. The young poets are still their own heroes ; he sees but the chiefs he celebrates. The young poets weave dreams with shadows transitory as clouds without substance ; he builds realities lasting as rocks. The young poets steal from all and sundry, and deny their thefts ; he robs in the face of day. Whom? Homer. Sir Walter would have rejoiced in Horatius as if he had been a doughty Douglas.

> 'Now by our sire Quirinus
> It was a goodly sight
> To see the thirty standards
> Swept down the tide of flight.'

That is the way of doing business ; a cut and a thrust style, without any flourish. Scott's style when his blood was up, and the first words came like a vanguard impatient for battle." Those were hearty words from an opponent, the amende honorable for prior disparagement. Such praise was high ; but it has been sustained by two generations of readers. Sir G. O. Trevelyan, nephew and biographer of Macaulay, says, in his uncle's life, that to June 1875 upwards of a hundred thousand copies of the ballads had passed into the hands of readers. That indicates the existence of a healthier public taste than moaning pessimists would willingly admit can be found. Many a schoolboy knows by heart the response of Horatius to the Consul's appeal to hold the bridge and save the town, when he spake out :

> "To every man upon this earth,
> Death cometh soon or late,
> And how can man die better
> Than facing fearful odds,
> For the ashes of his fathers
> And the temples of his gods.
>
> And for the tender mother,
> Who dandled him to rest,
> And for the wife who nurses
> His baby at her breast."

* * * * He and two comrades kept the foe in play :

> "For Romans in Rome's quarrel
> Spared neither land nor gold,
> Nor son, nor wife, nor limb nor life,
> In the brave days of old.

Then none was for a party ;
  Then all were for the state ;
Then the great man helped the poor,
  And the poor man loved the great ;
Then lands were fairly portioned ;
  Then spoils were fairly sold ;
The Romans were like brothers
  In the brave days of old."

The end of the lay is as well known as its beginning. In stirring verse the exploits of Horatius are sung. We are made eye-witnesses of his bravery at the bridge ; his plunge into the Tiber, and escape ; the gratitude of his country, and the statue in his honor :

" And still his name sounds stirring,
  Unto the men of Rome,
As the trumpet-blast that cries to them
  To charge the Volscian home ;
And wives still pray to Juno
  For boys with hearts as bold,
As his who kept the bridge so well
  In the brave days of old."

But it was no marvel that he, who at twenty-four could write the "Battle of Ivry," should at forty-two write the "Lays of Ancient Rome." The Huguenot song of triumph was recognized as a promise of greater things to come, and rightly so, for its opening verse is an outburst of exultation which strikes the heart as does an opening chorus from some great tone master :

" Now glory to the Lord of Hosts from whom all glories are !
And glory to our Sovereign Liege, King Henry of Navarre !
Now let there be the merry sound of music and of dance,
Through thy corn fields green, and sunny vines, oh pleasant land of France !
And thou Rochelle, our own Rochelle, proud city of the waters,
Again let rapture light the eyes of all thy mourning daughters.
As thou wert constant in our ills be joyous in our joys,
For cold and stiff, and still are they who wrought thy walls annoy,
Hurrah ! Hurrah ! a single field hath turned the chance of war,
Hurrah ! Hurrah ! for Ivry and Henry of Navarre."

A plaintive tenderness is the crowning glory of many Scottish ballads : they are as sad as music in a minor key. Of that class, "Waly, Waly," a ballad of about the middle of XVI century, is a good example :

"O Waly, Waly, up the bank,
  O Waly, Waly, down the brae,
And Waly, Waly, yon burn-side,
  Where I and my love were wont to gae !
I lean'd my back unto an aik,
  I thocht it was a trustie tree,
But first it bow'd and syne it brak',—
  Sae my true love did lichtlie me.

O Waly, Waly, but love be bonnie,
  A little time when it is new!
But when its auld it waxeth cold
  And fadeth awa' like the morning dew.
O wherefore should I busk my heid,
  And wherefore should I kame my hair?
For my true love has me forsook,
  And says he'll never lo'e me mair—

Noo Arthur's seat shall be my bed
  The sheets sall ne'er be press'd by me;
Saint Anton's well sall be my drink;
  Since my true love's forsaken me—
Martinmas wind, when wilt thou blaw,
  And shake the green leaves off the tree?
O gentle death, when wilt thou come?
  For of my life I am weary.

'Tis not the frost that freezes fell,
  Nor blowing snow's inclemencie,
'Tis not sic cauld that makes me cry;
  But my love's heart grown cauld to me.
When we cam' in by Glasgow toun,
  We were a comely sight to see:
My love was clad in the black velvet,
  An' I mysel' in cramasie.

But had I wist before I kiss'd
  That love had been so ill to win,
I'd lock'd my heart in a case o' goud,
  And pinn'ed it wi' a siller pin—
And oh! if my young babe were born,
  And set upon the nurse's knee;
And I mysel' were dead and gane,
  And the green grass growing over me!"

Of the border ballads, one of the best is "Jamie Telfer." Along the border in the olden time there was a class of impartial folk who:—

"Drove the beeves that made their broth,
  From England, and from Scotland both."

This ballad goes back to one Martinmas night when the Captain of the Bewcastle drove off Jamie Telfer's kye. The story runs:

"And when they cam to the fair Dodhead
  Right hastily they climbed the heel;
They loosed the kye out, ane and a'
  And ranshackled the house right weel.

Now Jamie Telfer's heart was sair,
  The tear aye rowing in his e'e;
He pled wi' the captain to hae his gear,
  Or else revenged he would be.

The captain turned him round and leugh;
  Said—"Man, there's naething in thy house
But ae auld sword without a sheath,
  That hardly now wad fell a mouse!"

The poor fellow ran ten miles through the sprinkled snow to Gibby Elliot, the only man who refused him help, saying:

"Gae seek you succor where you paid black-mail,
For, man! ye ne'er paid money to me."

He next carries the fray to auld Jock Grieve, who is married to his wife's sister; so he sat Jamie on the back of a weel fed bonny black and sped him on his way to give the fray to William's Wat, who with two sons joined him and took the fray to Branksome Ha'. His chief, bauld Buccleuch, heard the story, and said:

"Alack for wae!" quoth the gude auld lord,
"And ever my heart is wae for thee!
But fye, gar cry on Willie, my son
And see that he comes to me speedilie!

"Gar warn the water, braid and wide,
Gar warn it soon and hastily!
They that winna ride for Telfer's kye,
Let them never look in the face o' me!"

The country side was warned:

"And aye the ower-word o' the thrang
Was:—'Rise for Branksome readilie!'"

The raiders are overtaken with the cattle; there is a fight, with slaughter, in which the captain was wounded and the cattle rescued. When they were ready to go back, one of the party hinted that it would be poetic justice to take back with them a few of Bewcastle's kye, so:

"When they came back to the fair Dodhead,
They were a welcome sight to see!
For instead of his ain ten milk-kye
Jamie Telfer has gotten thirty and three."

From a border foray, to remembrance of Rob Roy, and the passing stave chanted by Wordsworth at his grave, is an easy transition:

"Heaven gave Rob Roy a dauntless heart,
And wondrous length and strength of arm;
Nor craved he more to quell his foes,
Or keep his friends from harm.

Yet was Rob Roy as wise as brave;
Forgive me if the phrase be strong;
A poet worthy of Rob Roy
Must scorn a timid song.

Say then that he was wise as brave;
As wise in thought, as bold in deed:
For in the principles of things
He sought his moral creed.

Said generous Rob, 'what need of books?
Burn all the statutes and their shelves;
They stir us up against our kind;
And worse, against ourselves.

We have a passion—make a law,
Too false to guide us or control!
And for the law itself we fight,
In bitterness of soul.

And puzzled, blinded, thus we lose
Distinctions that are plain and few;
These find I graven on my heart,
That tells me what to do.

The creatures see of flood and field,
And those that travel on the wind!
With them no strife can last; they live
In peace and peace of mind.

For why? because the good old rule
Sufficeth them, the simple plan
That they should take who have the power,
And they should keep who can.

A lesson that is quickly learned,
A signal this which all can see;
Thus nothing here provokes the strong
To wanton cruelty.

All kinds and creatures stand and fall
By strength of prowess or of wit:
'Tis God's appointment who must sway,
And who is to submit.

Since then the rule of right is plain,
And longest life is but a day;
To have my ends, maintain my rights,
I'll take the shortest way.'

And thus among these rocks he lived,
Through summer heat and winter snow;
The Eagle, he was lord above;
And Rob was lord below.

So was it—*would* at least have been
But through untowardness of fate;
For polity was then too strong—
He came an age too late.

And had it been thy lot to live
With us who now behold the light,
Thou would'st have nobly stirred thyself
And battled for the right.

For thou wert still the poor man's stay,
The poor man's heart, the poor man's hand,
And all the oppressed, who wanted strength,
Had thine at their command."

German literature is especially rich in ballads. Goethe, Schiller, and Heine were masters of the art; and to Uhland's fancy we are indebted for ballads of exquisite beauty. The Erlkœnig of Goethe was translated by Scott; and the translations, by Lord Lytton, of Schiller's ballads, are well known. Baskerville has translated many of Uhland's ballads. The "Minstrel" from the first part of Wilhelm Meister written by Goethe, in his youth, is a charming ballad:

"'What is it at the gate I hear?
  What on the bridge is sounding?
Let's have the singing to our ear,
  Along the hall rebounding.'
So spake the King; the page he ran;
  Back came the boy; the King again
Cried: 'Bring us in the Minstrel.'

'My greeting to ye noble lords!
  Ye gentle ladies greeting!
Like stars on stars rich heaven affords;
  Names fail at such a meeting.
In hall, of pomp and splendour full,
  I close my eyes, mine not the role,
Now, wonderingly to revel.'

With eyelids closed, the minstrel's call,
  Brings perfect tones o'erflowing;
The brave knights glancing round the hall
  And fair cheeks coyer glowing.
The King enchanted with such art,
  Cried: 'Give him for this wond'rous part,
A golden chain to pay him.'

'Give not the golden chain to me,
  But to the knights, who ever
In fight, before their helmets see
  Stern foemen's lances shiver.
Give it the Chancellor you keep,
  And let him add it to the heap
Of burdens he must carry.

'I sing but as the warbler sings
  That nestles in the bushes.
The song that without effort springs
  Rewards itself, and pushes
All else aside. Still this I pine,
  Let them a glass of generous wine,
Bring me in golden goblet.'

Before 'twas quaff'd he held it high,
  'Oh nectar sweet, refreshing;
And threefold happy family,
  Where thou are trivial blessing,
Heaven's joy be with ye; think on me;
  And thank ye God as fervently,
As I for this do thank ye."

The extract given from Wordsworth's poem calls to remembrance the "Lost Leader," by Browning. A letter in 1875, from Browning, acknowledges that Wordsworth was the lay figure for the "Lost Leader;" just as Dicken's admitted that Leigh Hunt was the prototype of Skimpole; and his own father of Micawber. Before middle life, Wordsworth lost some of his early ideals, and became out of touch with the aspirations of Browning. In his old age the latter, however, said the "Lost Leader" was not intended to be a full and true portrait of Wordsworth, or he would never have talked of "handfuls of silver and bits of riband," which he is sure never influenced the great poet's change of politics.

I.

"Just for a handful of silver he left us,
  Just for a riband to stick in his coat—
Found the one gift of which fortune bereft us,
  Lost all the others she lets us devote;
They with the gold to give doled him out silver,
  So much was theirs who so little allowed;
How all our coppers had gone for his service!
  Rags—were they purple his heart had been proud!
We that had loved him so, followed him, honored him,
  Lived in his mild and magnificent eye,
Learned his great language, caught his clear accents,
  Made him our pattern to live and to die!
Shakespeare was of us; Milton was for us,
  Burns, Shelley were with us—they watch from their graves;
He alone breaks from the van and the free men,
  He alone sinks to the rear and the slaves!

II.

We shall march prospering—not through his presence;
  Songs may inspirit us—not from his lyre;
Deeds will be done—while he boasts his quiescence,
  Still bidding crouch whom the rest bade aspire:
Blot out his name then, record one lost soul more,
  One task more declined, one more footpath untrod,
One more devil's triumph and sorrow for angels,
  One wrong more to man, one more insult to God!
Life's night begins; let him never come back to us!
  There would be doubt, hesitation and pain,
Forced praise on our part—the glimmer of twilight,
  Never glad confident morning again!
Best fight on well, for we taught him—strike gallantly,
  Menace our heart ere we master his own,
Then let him receive the new knowledge and wait us,
  Pardoned in heaven, the first by the throne."

"Sir Patrick Spens" is one of the best of the old Scottish ballads. It was first published in the Percy collection; but Sir Walter Scott was able, after much search, to give several additional stanzas

to Percy's version. Sir Patrick is commended to the King as "the best sailor that ever sailed the sea," and is sent by the King :

"To Noroway, to Noroway,
To Noroway o'er the faem,
The King's daughter of Noroway,
'Tis thou maun bring her hame."

They reached Norway safely, but when about to return, one of the seamen warned Sir Patrick that he feared a deadly storm, for :

"I saw the new moon late yestreen
Wi' the auld moon in her arm ;
And if we gang to sea master,
I fear we'll come to harm."

They hadna sailed a league, a league,
A league, but barely three,
When the lift grew dark, and the wind blew loud
And gurly grew the sea.

The ankers brak, and the topmast lap,
It was sic a deadly storm ;
And the waves came o'er the broken ship
Till a' her sides were torn."

Sir Patrick Spens went up the rigging to spy for land, but :

"He hadna gane a step, a step,
A step, but barely ane,
When a boult flew out of our goodly ship
And the salt sea it came in."

The efforts to save the ship were unavailing.

"And lang, lang may the maidens sit,
Wi' their gowd kaims in their hair,
A' waiting for their ain dear loves—
For them they'll see na mair."

The ballad poetry of Ireland deserves special consideration. Due attention to the ballads of John Banim, Gerald Griffin, and Thomas Davis, would alone exceed the limits of this paper, and to curtail them would reprehensibly mar them. I however, quote a short ballad from Lover and one from Moore. That from Lover is founded on the old superstition that when a beautiful child dies it is stolen by the fairies :

"A mother came when the stars were paling,
Wailing round a lonely spring ;
Thus she cried while tears were falling,
Calling on the Fairy King :

'Why with spells my child caressing,
Courting him with fairy joy ;
Why destroy a mother's blessing,
Wherefore steal my baby boy ?

'O'er the mountain, through the wild wood,
Where his childhood loved to play;
Where the flowers are freshly springing,
There I wander day by day.

'There I wander, growing fonder
Of the child that made my joy;
On the echoes wildly calling,
To restore my fairy boy.

'But in vain my plaintive calling,
Tears are falling all in vain;
He now sports with fairy pleasure,
He's the treasure of their train!

'Fare thee well my child forever,
In this world I've lost my joy,
But in the next we ne'er shall sever,
There I'll find my angel boy.' "

The ballad quoted from Moore is founded on the Mærchen that a maiden richly apparelled, and bearing a wand, on which she carried a ring of great value, travelled, without escort, unmolested, from one end of Ireland to the other:

"Rich and rare were the gems she wore
And a bright gold ring on her wand she bore;
But oh! her beauty was far beyond
Her sparkling gems, or snow-white wand.

'Lady, dost thou not fear to stray,
'So lone and lovely through this bleak way?
'Are Erin's sons so good or so cold
'As not to be tempted by woman or gold?

'Sir Knight, I feel not the least alarm,
'No son of Erin will offer me harm;
'For though they love women and golden store,
'Sir Knight, they love honor and virtue more.'

On she went, and her maiden smile
In safety lighted her round the Green Isle,
And blest forever is she who relied
Upon Erin's honor and Erin's pride."

The Rowley poems, interesting from their intrinsic value, and from the circumstances under which they were written by poor Chatterton, contain ballads of much merit. Chatterton pretended that his poems were written by a Bristol monk, a contemporary and friend of Lydgate, of Bury, and of the time of Master Canynge, Mayor of Bristol, and builder of the Church of St. Mary, Redcliffe, of that town. In the ballad of "The Bristol Tragedy" it is Master Canning who intercedes with King Edward for Sir Charles Bawdin, who was beheaded, and his body, according to the barbarity of the

times, mutilated for treason. The Bristol ballad is one of the best of the Rowley poems. For two centuries some of the Chatterton family were sextons at the Church of St. Mary, Redcliffe, Bristol. During Chatterton's life, his uncle was sexton. The boy poet gave it out that the poems he produced had been found by elder members of his family, in the muniment chest of Redcliffe Church, and were transcribed by him. To sustain his story illuminated documents were produced, as marvellous in their way as the poems, and these, and the boy's extreme youth, aided to keep up for almost a hundred years controversy as to the authenticity of these poems.

It was at Bristol that Joseph Cottle, the bookseller, nearly a hundred years ago, published a little work, called "Lyrical Ballads," of some interest in relation to our subject. That little book was the joint production of William Wordsworth and Samuel Taylor Coleridge, two men who have exercised great influence on English literature. The ballads of their volume were conjointly written by the two poets, when they were at their best, and during the period of their closest intimacy. Like the "Blue Boy" of Gainsborough, the artist, the work of each was done to illustrate a theory. Wordsworth and Coleridge differed in opinion as to the relative poetical value of incidents of common everyday life, and those which border on the supernatural. Each wrote ballads for this volume to prove his own theory. Wordsworth wrote more than a dozen pieces on his side; while, Coleridge wrote only one, the "Ancient Mariner," in proof of his contention. The essence of the controversy between these distinguished poets existed long before their day, and will divide the opinions of men long after them. But, if it did not settle their dispute, their controversy gave to the English language some of its best ballads. Both the "Ancient Mariner" and "Christabel" are too long to quote in their entirety, and to mutilate them would be a wrong:

> "Farewell, farewell! but this I tell
> To thee thou Wedding Guest!
> He prayeth well, who loveth well,
> Both man and bird and beast."

The songs of the people command passing reference. Thomas Hood, Ebenezer Elliott, Ernest Jones, and Gerald Massey have written ballads that are bright, humorous and delightful, but some of their songs are veritable voices from the depths, wails of despair that startle the ear, and make the heart ache. Their gloomiest

dirges have been serviceable. Hood's "Song of the Shirt," and Noel's "Pauper's Drive," with its doleful chorus,

> "Rattle his bones over the stones;
> He's only a pauper whom nobody owns,"

more effectively forced attention to the miseries of the poor than all the reports and figures compiled by commissioners: "I have had no childhood," said one of these men, "ever since I can remember I have had the aching fear of want throbbing in heart and brow." Who can wonder at the biting irony of his cry:

> "Smitten stones will talk with fiery tongue,
> And the worm, when trodden, will turn;
> But cowards, ye cringe to the cruellest wrongs,
> And answer with never a spurn.
>
> Then torture, oh! tyrants, the spiritless drove,
> Old England's helots will bear;
> There's no hell in their hatred, no God in their love;
> No shame in their dearth's despair.
>
> For our fathers are praying for pauper pay,
> Our mothers with death's kiss are white;
> Our sons are the rich man's serfs by day,
> And our daughters his slaves by night."

Of Burns it is needless to speak. His songs are universally known; and their merit everywhere appreciated. Hogg, the Ettrick shepherd, wrote with a grace beyond the reach of art. His "Kilmeny" and the "Jeanie Morrison," of Motherwell, are faultless. Poor Tannahill piped a reed of sweetest tone. What can surpass his "Braes o' Gleniffer?"

> "Keen blaws the wind o'er the Braes o' Gleniffer,
> The auld castle's turrets are covered wi' snaw;
> How chang'd frae the time when I met wi' my lover
> Amang the broom bushes by Stanley green shaw;
> The wild flow'rs o' simmer were spread a' sae bonnie,
> The mavis sang sweet frae the green birken tree;
> But far to the camp they hae march'd my dear Johnnie,
> And now it is winter wi' nature and me."

Lord Tennyson in his "Idylls of the King," clad the Arthurian legends with all the graces of modern poetry. With what resistless charm he depicts Sir Galahad, the perfect knight, whose purity enabled him to find the holy graal; and how he makes live again the less perfect knights of Arthur's court, who, subject to human frailties, were sometimes led into temptation, and sometimes failed to accord to others that forgiveness they implored from heaven for themselves. And how beautiful are his ballads. The wine from

his own vintage has the sparkle and delicacy of flavour of the wine he drew from the antique jars of the old legends. For example, read his "Lady Clare:"

It was the time when lilies blow,
And clouds are highest up in air,
Lord Ronald brought a lily white doe
To give his cousin, Lady Clare.

I trow they did not part in scorn,
Lovers long betrothed were they:
They two will wed the morrow morn,
God's blessing on the day.

"He does not love me for my birth,
Nor for my lands so broad and fair;
He loves me for my own true worth,
And that is well," said Lady Clare.

In there came old Alice, the nurse,
Said, "who was this that went from thee?"
"It was my cousin," said Lady Clare,
"To-morrow he weds with me."

"O God be thanked," said Alice the nurse,
That all comes round so just and fair;
Lord Ronald is heir of all your lands,
And you are not the Lady Clare."

"Are ye out of your mind, my nurse, my nurse?"
Said Lady Clare, "that ye speak so wild?"
"As God's above," said Alice the nurse,
I speak the truth: you are my child.

"The old Earl's daughter died at my breast;
I speak the truth as I live by bread;
I buried her like my own sweet child,
And put my child in her stead.

"Falsely, falsely have ye done,
O mother, she said, "if this be true,
To keep the best man under the sun,
So many years from his due."

"Nay, now my child," said Alice the nurse,
"But keep the secret for your life,
And all you have will be Lord Ronald's,
When you are man and wife."

"If I'm a beggar born," she said,
"I will speak out, for I dare not lie;
Pull off, pull off the brooch of gold,
And fling the diamond necklace by.'

"Nay now, my child," said Alice the nurse,
"But keep the secret all ye can,"
She said, "not so; but I will know,
If there be any faith in man."

"Nay now, what faith?" said Alice the nurse,
The man will cleave unto his right,"
"And he shall have it," the lady replied,
"Though I should die to-night."

"Yet give one kiss to your mother dear!
Alas, my child, I sinned for thee,"
"O mother, mother, mother," she said,
"So strange it seems to me."

"Yet here's a kiss for my mother dear,
My mother dear, if this be so,
And lay your hand upon my head
And bless me, mother, ere I go."

She clad herself in a russet gown,
She was no longer Lady Clare:
She went by dale, and she went by down,
With a single rose in her hair.

The lily-white doe Lord Ronald had brought
Leapt up from where she lay,
Dropt her head in the maiden's hand,
And followed her all the way.

Down stept Lord Ronald from his tower;
"O Lady Clare, you shame your worth!
Why come you drest like a village maid,
That are the flower of the earth?"

"If I come drest like a village maid,
I am but as my fortunes are:
I am a beggar born," she said,
"And not the Lady Clare."

"Play me no tricks," said Lord Ronald,
For I am yours in word and deed.
Play me no tricks, said Lord Ronald,
"Your riddle is hard to read."

O, and proudly stood she up!
Her heart within her did not fail;
She looked into Lord Ronald's face
And told him all her nurse's tale.

He laughed a laugh of merry scorn;
He turned and kissed her where she stood;
"If you are not the heiress born,
And I," said he, "the next in blood—"

"If you are not the heiress born,
And I," said he, "the lawful heir,
We two will wed to-morrow morn,
And you shall still be Lady Clare."

These ballads are but as a drop from the ocean. Lack of space precludes reference to humorous ballads, of the class found in the "Bon Gaultier" book. And there are Irish, Spanish and Norse ballads of wondrous beauty; songs from France, including those of

Beranger, the prince of song writers; ballads from Greece, the land where the singer's art sprang at once to perfection; songs from Italy, where Dante shewed that the vulgar tongue could touch the heart as effectively as the classic speech of the Cæsars; and the ballads of Poe, Longfellow, Whittier, and Lowell in the new world; of which no mention can be made. Regretfully one turns from these: for at hazard stanzas by the score might be taken, that have made life brighter, toil pleasanter, and the world better.

The modern ballads by Goethe, Scott, Schiller, Wordsworth, Uhland and Tennyson, need no comment. Gems of song from the treasury of the master singers of the century need no commendation. They are as wine that needs no bush; and they will delight readers without end in the days to come. The ballads of the olden time, like those by and for whom they were sung, bear a composite character in which good and evil are curiously blended. But their sturdy merit bears scrutiny, and fears no criticism. There is no cause to exaggerate their merits, or screen their defects. In some will be found coarseness of thought and expression; while others are common-place and abound in puerilities that are wearisome. But in many, may be found a combination of force, sweetness, and pathos unsurpassed, and but rarely equalled in literature. Sir Phillip Sydney could be moved by Chevy Chase, however rudely recited, as by the blast of a trumpet; and, in this practical age, to thousands the past brings no remembrance of sweeter pleasure than that of the hours of childhood, spent at the knee of some venerated, though perhaps illiterate, member of the early home, who at the cottage hearth, in the evening gloaming, by oft-repeated recital of these old ballads, made the young heart dance with joy never to be forgotten.

NOTES ON THE FLORA OF THE NIAGARA PENINSULA AND SHORES OF LAKE ERIE.

Read before the Hamilton Association, January 12th, 1893.

BY JOHN MACOUN, M. A.

To anyone not acquainted with the flora of Ontario in its eastern and northern parts, a visit to that part lying south and west of Hamilton would present so many points of contrast that the impression made would not be easily forgotton. Such has been the case with myself, and the vivid impressions made on my first visit with Dr. Cowdry in 1877 have been intensified by my subsequent ones.

The grandeur of the forests south of Hamilton and east of the escarpment must have been very impressive to the early settlers, and to the botanist a source of wonder. Perhaps in no part of America on the same number of square miles are there so many species of native trees as are found there to-day. It is *too* true that some of the more interesting are becoming very scarce and are almost unknown to the younger part of the community, yet their scarcity in the present is no proof of their rarity in the past. Owing to frequent changes in soil the rarer trees are very local and seem to be passing out of the remembrance of the present generation, in nearly all the localities where they have been. While at Niagara-on-the-Lake last summer I was desirous of getting a photograph of a well developed Sassafras, and if possible one of a group of the Cucumber-tree (*Asimina triloba*). I had seen poor specimens of the Sassafras at Grimsby and Jordan Station, but wanted better, so after long hunting and many talks I found a few on the outside near Four Mile Creek and a large one was discovered in a field still further to the north. Of the Cucumber-tree I could get no trace whatever. The preceding year I had looked for it where I found it in 1877, at the foot of Queenston Heights, but the forest was cut away and the memory of its existence had passed from the people. By

good fortune I had made the acquaintance of Mr. Roderick Cameron, foreman at Niagara Park in the summer 1891, and, he being a close observer and a very good local botanist, I asked him to look out for the tree. He found it in flower somewhere between St. David's and the escarpment, where, I am unable to say, as I failed to find it. In company with a Mr. H. N. Topley, our photographer, the roads were traversed in all directions and every man, woman and child we came across interviewed, but without success. When we were about to give up the quest we saw in the distance men at work on the roads and as a last resource we interviewed them with the same results. As I turned away a young man said : " over in that field, there is an old man who knows *everything*, *he* can tell you if such a tree exists, if anyone can." The old man knew, and rising from his knees—he was trimming turnips —pointed to a dead pine in the forest and said : " beyond that tree on an old road you will find what you are looking for." His directions were so precise that we had no difficulty in finding the clump of Cucumber-tree, and although the day was showery we obtained two fine photographs. When going to the spot we came out on the ridge south of Merriton which seemed to be about a mile to our right.

While at Niagara Falls in 1891 we obtained photographs of nearly forty species of native forest trees, and travelled over many miles of country roads, made many enquiries for Sassafras, but could get no account of any outside the thick woods, yet on our return from the trip just spoken of we came upon a farm completely surrounded by them, and nearly all very fine specimens.

I wish just here to call attention to the fact that our boasted system of education is very much like the missionary work of the churches. In no section of Ontario have I found an intelligent appreciation of their surroundings among the school children and young people generally, and yet ignorance, in another sense, does not exist. The Church, like the children, is well posted regarding foreign heathen, but our own heathen, which are in both city and country, are too local to be of much account, or bring *ends* to any society.

The early settlers of the Niagara Peninsula were wiser than they knew when they left so much half-cleared land and allowed so many single trees to grow up to maturity in their fields and fence corners. To-day the beauty of the country and the enhanced value of the land is largely due to this cause. So many trees scattered

over the land break the bitter blasts of winter, and moisten the scorching breath of the summer breezes, and so in both summer and winter is the land fitted for what it is—the Garden of Canada. There is no use in disguising the fact that the careless habits of the last generation have been the making of the present, and if the country from Hamilton to Niagara-on-the-Lake was so completely de-forested as in the *well-cleared* lands of Ontario, its boasted title of the Garden of Canada would be a misnomer.

Nowhere in the Province have I seen finer specimens of the various species of *cratægus* (white thorn), than on the common at Niagara-on-the-Lake. A botanical student can there distinguish very readily the cock-spur Thorns (*cratægus ems-gath*) from the various forms of the Scarlet-fruited Thorn (*cratægus coccinea*). All the forms have become beautifully-shaped trees with wide-spreading crowns, and are marvels of beauty when in flower or when laden with mature fruit. Near the upper part of the open ground are some fine specimens of the Sour Gum (*Nyssa Multiflora*) which would be ornaments anywhere and at anytime, but seen when in full flower with its glossy light-green leaves, in the latter part of June, it is a charming object. This is by no means a rare tree, but seems to be very little known, although it is common on Queenston Heights and in many parts of Essex and Elgin Counties.

The oaks in numerous species are found scattered all over the peninsula, but each species has its own particular habitat. The species common to almost all soils are White Oak (*quercus alba*) and two Black Oaks (*Q. rubra and coccinea*). On the river banks and scattered through the country are two species, the Mossy Cup Oak, (*Q. macrocarpa*) and the Swamp White-oak (*Q. bicolor*). These species are very often taken the one for the other, but when in fruit they are easily distinguished by the latter having long-peduncled fruit. while the other has the mossy-fringed cup which gives to it its trivial name. On the river bank between the Whirlpool and Foster's Flats are groves of Chestnut Oak (*Q. Prinus, Linn.*) that would be taken for Chestnut (*Castanea vulgaris, var. Americana*) by a common observer, so much are they alike. While the latter tree is in flower, however, about the middle of July, it cannot be mistaken for anything else owing to its great bunches of catkins (barren flowers) near the ends of its branches. A very beautiful and valuable oak is the Swamp Oak or Pin Oak (*Q. palustris*) which delights, as its name indicates,

in all the boggy clay soils of the Peninsula. Its long pendan branches distinguish it from all other species.

No less than five species of Hickory rear their stately forms in close proximity to Niagara Falls. The three edible species are (*Carya alba*, *tomentosa*, and *microcarpa*), while the Broom Hickory (*Carya porcina*) and the Bitter-nut Hickory (*Carya amara*) have fruit that are seldom eaten except by boys when in extremity.

Two flowering trees that are almost peculiar to the district should be mentioned, the Flowering Dog-wood (*Cornus florida*), which may be seen bordering the forest from Niagara to Sarnia, and the Tulip Tree (*Liriodendron Tulipifera*) which carries the mind into the tropics, when one of these trees is seen, in the open fields about the 1st of July, of a pyramidal form and covered with gorgeous flowers. Such trees are not uncommon in the open fields in Elgin and Essex. Many other trees claim attention in the neighborhood of Niagara, but we may only mention the Sycamore or Buttonwood (*Platanus occidentalis*) which, whether we consider its size, its leaves or its deciduous bark, can claim a passing notice. It is unique in our forests and indeed is without a relative in North America, and as Dr. Gray puts it in his manual, as being of uncertain relationship to any of the modern trees. It is therefore, very likely, a remnant from a dead past, and when seen should remind us that our time is but a fragment of the earth's life: that this solitary tree proves that time in covering the earth with beautiful forms was not limited to years, but that one age succeeded another, and as the conditions changed the then-existing forms changed with their environment, retaining their vigor, or died out and gave place to others more in accord with changed conditions.

While collecting plants on the islands in the Niagara River I came upon immense quantities of Mezereum (*Daphne Mezereum*), and as it is a European shrub it is of more than passing interest. Flowering in the early spring with the Hepaticas, Dirca and other early blossoms, one would think that our climate would not suit it, and that in a year or two it would disappear. On the contrary it forms much of the undergrowth on one of the islands, and I question much if any citizen of Hamilton has ever seen it in city gardens. It has also been found in woods close to Ottawa, and on Montreal Mountain, but in neither case has a hint been given how the first specimens originated. The old French occupation may have had something to do with it.

Foster's Flats, between the Whirlpool and the village of Queenston, are full of interesting plants, while the woods on either side of the railway, leading up the face of the escarpment, contain many rare and interesting things. In the Flats the Green Violet (*Solea concolor*) is not uncommon, and hanging from the trees may be seen the Summer Grape (*Vitis æstivalis*) which, indeed, is common in many places along the escarpment. Along the railway, with a multitude of interesting things, may be gathered the Squaw Huckleberry (*Vaccinium Stamineum*), the Great Solomon's Seal (*Polygonatum giganteum*), the American Columbo (*Frasera Carolinensis*) and *Asclepias quadrifolia* hitherto considered a rare plant in Ontario. In the woods near Jordan Station on the Grand Trunk were collected specimens of the Yellow Round-Leaved Violet (*Viola rotundifolia*) and the beautiful and rare Bell-wort (*Uvularia perfoliata*).

Port Colborne and Welland Junction are good collecting grounds, and at the latter place the Turk's Cap Lily (*Lilium superbum*) attains great perfection in the damp woods, while of less conspicious things the finds were too numerous to mention.

Port Rowan was visited for the purpose of ascertaining whether the flora of Long Point came from the south shore of Lake Erie or from the Canadian side. Nothing was seen on the Point to show that a solitary species had come from the south, but all were represented on the mainland. The Point consists of a series of transverse sand ridges more or less consolidated with, generally, marshes between, and neither rock as boulder, or rock in situ was seen. About a quarter of a mile to the east of the wharf at Port Rowan an important discovery was made; here was noticed from the roadside a large patch of Water-lilies which seemed in the distance to have large round leaves without a sinus. I asked a passing resident what kind of Water-lily that was, and he answered "the common white one." Being still an unbeliever I went to the beach and found a peltate leaf on the shore. I had found the Sacred Bean (*Nelumbo lutea*). How it got there is an open question, but doubtless the seeds were planted by the Indians that must formerly have lived at Long Point. It is reported to be in the Grand River near Dunnville, but if so I have not seen it.

Pelee Island was visited, and the vicinity of Leamington, and numerous rare and interesting plants were collected. The Point is

chiefly sand, but there are nuclei of rocks around which it very likely gathered when the Point was being formed. Amongst the more noteworthy herbaceous plants were *Hibiscus Moscheutos*, the Swamp Rose Mallow, which, besides being quite rare, produces the largest flowers of any native plant. These are from four to six inches in diameter, of a light rose color, inclining to white, and are produced in succession, like the Hollyhocks of the gardens. They may be found in the marsh about half a mile from Sturgeon Creek Bridge, at the entrance to the Point, and to the left of the road. They were in full bloom July 30th, 1892. Later in the season fine patches of them were seen in the marshes on Pelee Island, and on marshy islands in Detroit River. Another herbaceous plant, with a very limited range in Ontario, is the Wild Potato Vine, or Man-of-the-Earth (*Ipomœa pandurata*). This plant often produces a huge root that frequently weighs ten or twenty pounds. This species was found in sandy fields near the southern extremity of the Point, and it was afterwards found in sand on the southern point of Pelee Island, and is doubtless a drift immigrant from the other side of Lake Erie. Another species found on the sand hills is the Honey Locust, or Three-thorned Acacia (*Gleditschia triacanthos*), which has certainly drifted across, as its great pods would drift for months without breaking up. Many of the trees were of a very fair size, and in some cases were amongst the Red Cedar, showing that they were not new arrivals. The same tree was observed on Pelee Island at the south end, and under the same conditions.

Another rare, and, in some respects, peculiar species, which is found on the Point, is the Shrubby Trefoil, or Hop Tree. This tall and beautiful shrub grows in the drifted sand of the Point, and also on the southern extremity of Pelee Island, and undoubtedly drifted from the south side of Lake Erie, as its fruit grows in great bunches. Each being first surrounded by a wing like an elm seed, but much larger, would be exceedingly buoyant and float any distance.

The soil around Leamington is variable in character, but westward of the road to Pelee Point is rather sandy, and hence supports a series of southern forms not often found in such numbers. Growing in profusion south of the railway, and west of the road leading to the wharf, were gathered *Polygala incarnata*, *Solidago rigida*, *Baptisia tinctoria*, *Lechea major*, *Anychia dichotoma*, *Desmodium ciliare*, *rotundifolium* and *canescens*, and many others. In a swamp

south of the Leamington and Walkerville Railway were gathered *Rhus venenata*, *Habenaria ciliaris*, *Archemora rigida*, *Polygonum Virginianum*, and lovely specimens of more common species. It was a veritable botanist's paradise, and the bright Orange Orchid was hailed with delight, and at once placed at the top of the Fringed Orchids.

All the above species are rare in Ontario, and some of them were altogether, if not almost, unknown to the botanists of our time, though reported from Canada many years ago. Dr. Burgess, one of your own members, found the Orchid, very likely in the same swamp I speak of, some years since.

Pelee Island has many features peculiar to itself, and its flora partakes of these in a large degree. Its surface is composed of marsh, extensive tracts of level ground covered with excellent soil, a few rocky ridges and a southern extension of almost pure sand. Each of these tracts has a flora generally distinct from the other, that of the marshy part being identical with the marsh bordering the mainland. The rocky ground at the north end and in the centre has a few forest trees seldom if ever met with on the mainland. One of these the Blue Ash (*Fraxinus quadrangulata*) can be seen in company with the Red Ash at the "Quarries," and may be distinguished at once by the younger branches being quadrangular or four sided. Growing near it are specimens of the Kentucky Bean-tree (*Gymnocladus Canadensis*), but the finest trees have disappeared since I was there in 1882. In the woods on the centre of the island are numbers of a rare Basswood (*Tilia pubescens*, *Ait.*,) which can be separated from the common Basswood (*Tilia Americana*) on sight, by its smaller, thinner, and less shapely leaf. The round fruit, when compared with the ovoid fruit of the common tree, shows that there is no intergrading and that this is a distinct species. It would be interesting to discover whether this tree reaches the mainland or not. Who will find out?

In conversation with Dr. McCormack, a native of the island, I was informed that a remarkable tree grew on the south end of the island, that many years ago produced an abundance of lovely red flowers in early spring before the leaves came out. I told him that this could be none other than the Red-bud or Judas Tree (*Cercis Canadensis*) and next day I examined the south point and found the tree. It had been undermined by the waves and fallen inland, and

more than half of its limbs were dead, but it still bore leaves and what remained was quite healthy. It will soon disappear, but the record of its existence will remain.

There were numbers of interesting herbaceous plants, but the least known are all I need give. There were Loosestrife (*Lythrum lineare*) and *Conobea multifida*, the latter not hitherto recorded in Canada. Of shrubs, the climbing Prairie Rose (*Rosa setigera*) deserves particular attention as it is quite common, produces multitudes of flowers, is a climber and should be cultivated. Another climber, the Trumpet Creeper (*Tecoma radicans*), was growing wild on the sand at the southern extremity, and doubtless was an immigrant from further south. I may mention in this connection that this species attains wonderful luxuriance in and around Chatham, and when seen in full flower climbing amongst conifers, and other trees, its orange-scarlet flowers make a series of beautiful pictures that have only to be seen to charm the *mind's eye* ever after.

By a judicious system of ditches or canals much of the marshland at Pelee Island has been drained and very soon all will be fit for use, and then, if we get closer trade relations with the country to the south, the dwellers on the Island will supply vegetables at a nominal price to the cities on Lake Erie. Apparently market-gardening has not reached the Island, but it surely will, and then the almost inexhaustible soil will be put to a better purpose than it is at present. The future of the Island is not bound up in the making of wine, but better trade relations will convert the Island into a big vegetable garden and its trade will increase a thousand times.

I wish now to say a few words concerning the rare or peculiar plants found at Amherstburg, Windsor, Sandwich and Chatham, and to remark that in my opinion a summer could be well spent by an experinced botanist along the Detroit River and Lake St. Clair, and that much valuable information could be gathered that would be of use to all classes. Geologically the river and lake are not barriers to the distribution of species, and it is not surprising to find many prairie species, conspicuous for their size, at home on our side of the river. It is a surprise, however, to find the more humble individuals wanting, and a cause should be looked for, if this statement be true.

On the eastern bank of the Thames, in Chatham, just where the Erie and Huron Railway crosses that river, may be seen two ex-

tremely tall and conspicuous prairie plants; these are the Cup-plant (*Silphium perfoliatum*) to the south of the bridge, and *Actinorneris squarrosa*, *Nutt.*, on the north side. Both these were over six feet high last August, and still growing. In one field near the eastern end of Sandwich were seen the tall Coreopsis (*Coreopsis tripteris*); the Cone Flower (*Lepachys pinnata*); the Rosin Weed or Prairie Dock (*Silphium terebinthinaeum*) all growing from 6 to 10 feet high. Others not so rare might be enumerated but these will suffice to show that if such plants as the above have been overlooked or scarcely ever recorded how many others there are that might throw light on what I term the eastern extension of the prairie flora.

In a sandy field at the southern end of Sandwich a long lost Canadian species was discovered, I refer to the Orange Grass or Pine-weed (*Hypericum Sarothra*, *Michx*). Growing with it were two very inconspicuous little things both new to Canada. They were *Hemicarpha subsquarrosa*, *Nees.*, a dwarf annual from one to five inches high and *Fimbristylis Capillaris*, *Gray*, another minute thing. Crossing a little hollow with a small stream running through it, a garden of rarities was entered and in a few minutes our portfolio was filled with good things. The more interesting were *Liatris spicata*, *Archemora rigida*, *Aletris farinosa*, *Lythrum lineare*, and *Alatum*, *Polygala incarnata*, *Hypoxis erecta*, *Ludwigia alternifolia*, *Veronica Virginica*, and at least a dozen others.

In conclusion allow me to say that in these few notes, hurriedly thrown together, I have attempted to embody a part of the observations made during the past summer for the special purpose of stimulating any youthful botanist that may be in the room, and to show to the older ones that in no department of geographical botany has the study of our plants been exhaustive. The more I know of our flora, the more deficiencies I find in our knowledge and the more desirous I become to have additional observers in the field, so that in time we may fill up the gaps that I know exist. I have carefully kept from speaking of the more commonly noticed plants and trees, because much good work may be done by parties having less opportunities than I have, if we give them an opening and encourage them to enter it.

SOME PROBLEMS IN HORTICULTURE.

2.—INSECTS INJURIOUS TO PLANTS.

Read before the Hamilton Association, March 9th, 1893,

BY L. WOOLVERTON, M. A.

The title of this paper, as I first wrote it down, was misleading. It was "Insects Injurious to the Fruit Grower." A lady seeing it remarked, "Your subject seems to be rather a limited one; with how many insects is the fruit grower affected?"

In a way, surely the fruit grower is affected by all those insects which injure his fruit—his pockets certainly suffer to an immeasurable extent. It has been computed that hundreds of thousands of dollars are annually lost to our fruit growers, through the injuries caused by our insect enemies.

I am well aware that in treating upon insects I am treading upon well-worn ground, and I can scarcely be expected to bring before you any new discoveries. The pathways are well worn by such masters of entomology as Riley, Packard, Saunders, Harris, Ormerod, Pettit, and numerous others. Mr. Packard's work is too general for the use of the fruit grower; Harris' is most interesting, but not arranged well enough, nor is it sufficiently complete to meet the needs of the practical fruit grower; Riley's work for the United States, and Miss Ormerod's for England are invaluable, but it remained for our own Professor Saunders to write a book, under the title of the above heading, exactly suited to the needs of Canadian fruit growers, arranging it for practical purposes under such heads as "insects injurious to the apple," "to the pear," "to the peach," "to the grape," etc., classifying the different insects under each head according to the part which they affect, whether the root, bark, leaves or fruit. This has proved a most convenient arrangement. I would suggest to some of our amateur collectors that they might make for themselves a most interesting collection on this same basis. This would not be so scientific an arrangement from an entomological

point of view, but it would be exactly right in the eyes of the professional horticulturist.

It would obviously be absurd for me to attempt to cover in a paper like this even a general survey of the ground so well gone over by Professor Saunders, I shall only attempt to give you some idea of the more well-known injurious insects which just now are great obstacles in the way of success in making the garden and orchard profitable throughout the fair Province of Ontario.

At the very head of our enemies in the insect-world is the Codling Moth, (*Carpocapsa pomonella*). Like other insects, it is increasing with the increasing supply of apples for it to feed upon, until of late years it has threatened the total destruction of our apple crops. A few years ago, before the practice of spraying with arsenites came into use, the pest became so serious that one-third of the crop had to be thrown out as seconds, purely on account of its ravages. If these insects were content to feed upon the poorest of the fruit we would not grumble, as they would do us a good turn by thinning out our fruit, but, unfortunately, they choose the fairest and best, thus directly robbing us of our hard-earned profits.

Many and very ingenious devices have been tried to keep these insects under control, as, for instance, trapping the moths with bottles of sweetened water; by twisting hay bands about the trunks of the trees, into which the larvæ would crawl to pupate, and then wringing these bands through a wringer to destroy the cocoons; by keeping sheep and pigs in the orchard to eat the infested fruit, worms and all, as it falls to the ground, but every one of these devices has served only to check, not rid us of the evil.

Can the fruit growers be blamed then because, when the use of arsenites sprayed on the trees and fruit was found to be a success, they adopted it almost universally. I speak of this because objection has been made on scientific grounds to the use of arsenites, since by the use of them not only the injurious, but also the useful insects are often destroyed, and, among the latter, many parasites whose friendly office might in the end keep these enemies in check without the expense and trouble of applying poisons. The true principle, they say, is to favor the increase of these parasites and introduce other insect friends and thus cope with our foes in a manner which can be approved of on scientific grounds.

Possibly such a course would be the wiser one in the end, but "a bird in the hand is worth two in the bush," and I fear the fruit growers have no patience to sacrifice a present advantage for an ulterior good.

There are two broods of this moth; the first is on the wing about the time of the opening of the apple blossoms, when each female deposits her tiny eggs singly in the calyx-end of the apple; and, as each moth deposits on an average about fifty eggs, it is easy to see how rapidly the insect may increase. There is a second brood of the moth in the latter part of July, but, if the first brood is destroyed, the second will be, of course, destroyed with it. Hence arsenites, applied once of twice in June, will ensure a fairly sound crop of fruit.

Year by year less poison in dilution is found to be sufficient to accomplish the purpose. One pound of Paris green to 200 gallons of water is the usual prescription, but many experimenters have found that 250 gallons will not form too dilute a mixture.

Formerly it has been necessary to depend upon American inventors for tools for this work, but there are one or two spraying pumps invented in Canada which now answer our purpose well.

How best to cope with the Curculio has long been a problem. Not only are the plum, apricot and peach stung and caused to drop by means of its evil doings, but the apple and pear are also subject to its ravages, and, as a result, are much knotted and ill-formed. On this account the apricot is little grown in Southern Ontario where it might, otherwise, succeed well, and many fruit growers are even debarred from engaging in the cultivation of plums.

Until spraying with Paris green was introduced, jarring of the trees was the only method adopted and, where faithfully performed, has been, on the whole, successful; some experimenters claim that it is more effective than the use of Paris green. The operator jars the tree with a sharp tap of a mallet and the "little turks" are gathered up in a sheet and burned. This must be continued every day until the plums are well grown. It is a much simpler plan to give the orchard one or two good sprayings, which will suffice, unless constant rains wash off the poisons, providing always that the first application is made almost as soon as the foliage appears, in order to destroy the parent beetles. The preferable method is scarcely yet settled. Professor Green, of the Ohio Experiment Station, strongly

advocates the spraying method as most effective, while Professor Beal, of the Michigan Station, favors jarring.

The Curculionidæ is a numerous family and nearly all are harmful Mr. Billups, who read a paper at one of our meetings at Niagara, stated that the members of this family number nearly ten thousand species, many of which are injurious to our fruits.

The Oyster-Shell Bark Louse is one of the worst pests of our Canadian apple orchards because it works almost entirely unseen by ordinary observers on account of its small size. Some of our worst foes are so minute that their presence can only be discerned by the use of a microscope. In its first stages this louse is almost microscopic. The eggs, which lie all winter concealed under the dead body of the parent louse, hatch out into tiny lice which emerge from their covering during the warm days of the early part of June, and in about a week they settle down upon some smooth place on the limbs, often concealed from view by patches of old bark. There they spend the summer sucking the juices of the tree, weakening its vigor, until full grown, when each becomes a scale, covering in its turn three or four score of eggs. When I first discovered it, I found many trees almost dead through its effects. The bark was rough, but I had not previously suspected that these rough places were scales concealing young lice. Lousy trees! What a disgrace! I soon set to work with alkaline solution, such as washing soda and potash, and also with kerosene emulsion, and by their use have succeeded pretty well in destroying them. If neglected, these insects will in time completely cover a tree, even to the outer branches, and it is difficult then to reach them with broom or scrubbing brush. The only plan left is to spray the whole tree with an alkaline solution and kerosene emulsion. Some of the formulas recommended are as follows:

Kerosene Emulsion:—Soft soap, one gallon, or hard soap (whale oil soap preferred), one-quarter of a pound; two gallons of hot water, and one pint of kerosene. Stir until all are permanently mixed, and then dilute with water to one-half or one-third strength. This will be found one of the most effective remedies for the Oyster-Shell Bark Louse. Another more simple remedy and yet, if faithfully applied, quite effective is a soda wash made by dissolving one-half a pound of common washing soda in a pail of water. Alkaline

wash may be made of common lye and water, which, if applied during the first week of June when the young insects are first hatched out and are in their most tender stage, will, in most cases, answer every purpose. If concentrated lye is used a pound should be diluted in a barrel of water.

Among the newer enemies which the fruit growers have to meet are the Pear Tree Psylla and the Raspberry Gall Fly, and of these we give a brief notice.

Pear Tree Psylla.—The Pear Tree Psylla bids fair to become one of the most troublesome enemies in fruit growing which has yet appeared. As if it were not enough to discourage pear growers that the blight so often destroys their finest trees and the Curculio and Scab ruin their finest fruit, this tiny insect must appear, emigrating from Europe, and completely wreck their bright hopes of success. Only so recently as 1891 was this insect noticed as a formidable enemy, and pear growers in various parts of the Eastern States lost thouands of dollars worth of fruit and many valuable trees through its ravages.

A very excellent bulletin by Professor Slingerland, of the Cornell Experiment Station, devoted to this insect, has been published, from which we gather much of the accompanying information, in advance of its ravages; for there is little doubt that Canadian pear orchards will be visited by it during the coming spring.

Already New York State has suffered severely. Mr. H. Wright's orchard, near Ithaca, N. Y., promised in 1891, 600 bushels of fruit, but less than fifty bushes matured, and but a few trees made any growth. Mr. G. T. Powell, of Ghent, N. Y., a prominent fruit grower, stated that the insects reduced his pear crop that year from an estimated yield of 1,200 barrels to an actual yield of less than 100 barrels of marketable fruit. Besides this the trees in the orchard had a stunted appearance, no doubt owing to the attacks of this pest.

The Pear Tree Psylla was first introduced into this country from Europe in 1832, by Dr. Plumb, of Salisbury, Conn. The year after he first noticed it, and during the next five years, he lost several hundred trees by its ravages. From various reports it appears that the pest has already reached the Mississippi Valley in its progress. The severe outbreak of 1891 proves that in New York State, at least, it has become so numerous that it only requires favorable opportunity to do an exceeding great amount of damage.

Entomologists class the Psylla as belonging to the family Psyllidæ, or Jumping Plant Lice, under the sub-order Homoptera. The general name Psylla is derived from the Greek word meaning a Flea. In Europe there are three species which infest the pear tree, and our species, Pyricola, is not the worst. Let us hope, therefore, that its relatives may never reach us.

Among the indications of its presence are the following:

The old trees will be observed to make little new growth; new shoots droop and wither in May as if from loss of sap. A little later the old trees put on a sickly appearance; the leaves will turn yellow, and the fruit grow but little, and about midsummer most of the leaves and half formed fruit will fall from the trees. Besides this the insect secretes a large amount of honey dew which covers the twigs, trunks and branches of the trees after the leaves expand, as is found throughout the season. At first this substance is clear like water, but soon assumes a disgusting blackish appearance, owing to the fungus growth within it

Mr. Slingerland visited Mr. Wright's orchard at Ithaca, in the latter part of November, 1891, and states that the whole orchard appears as if a fire had swept quickly through it, scorching trees and blackening trunks, large branches and the smallest twigs. The Bartlett and Duchess varieties suffered the most.

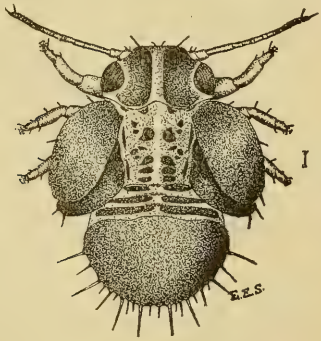

FIG. 1.

FIG. 2.

The insect may be perhaps recognized from the following points of description, together with the accompanying illustrations:

Fig. 1 represents the nymph or immature forms when first hatched. They are translucent yellow in color, and hardly visible to the naked eye, eighty of them placed end to end would scarcely

measure an inch, but they increase in size until about twenty of them would measure an inch. A very conspicuous feature is a broad black wing pad on each side of the body. Fig. 2 shows the adult insect which strikingly resembles the Cicada in miniature; it would take nine or ten of these placed end to end to measure an inch, and the hair line in each case by the side of the insect shows the natural size. The general color is crimson, with broad black bands across the abdomen. The legs have thickened femurs to aid the insect in leaping.

Mr. Slingerland found, when examining Mr. Wright's orchards in winter, hibernating broods of adults. They were hidden in crevices of large trees; a favorite hiding-place on some trees was in the cavity of the bark about the scar of the severed limb. By April, 1892, the larger part of the eggs had been deposited singly. These had been placed in the creases of the bark, or in old leaf scars, about the bases of the terminal buds of the preceding year's growth. The eggs are small and shining, and of a light orange yellow color. A short stalk on the larger end attaches the egg to the bark, and a long, thread-like process projects from the other end. By the 18th May the most of these eggs are hatched out, and the minute nymph immediately seeks a suitable feeding place, where it sucks the sap with its short beak, a favorite place being in the axils of the leaf petioles and stems of the forming fruit. In about a month they are adults. The adult has strong legs and wings, and thus is able to move readily to distant orchards.

To be forewarned is to be forearmed, and, therefore, the importance of making public at this time the methods of combating this pest, as laid down in Mr. Slingerland's bulletin, is evident.

None of the fluids applied seem to be destructive to the eggs, but the nymphs are found to be easily destroyed by kerosene emulsion. The emulsion was prepared after the following formula:—One-half pound of hard or soft soap, one gallon of water and two gallons of kerosene. This was then diluted with twenty-five parts water, and in every case the nymphs were destroyed almost immediately after coming into contact with the liquid. The best time to spray for this nymph is early in spring, just after the leaves have expanded, probably, as a general rule, the two weeks succeeding the 15th of May. If this is faithfully done, the pest will be completely checked for the season.

Raspberry Gall Fly.—This is by no means so formidable an enemy as the last, but it is one almost unnoticed in Ontario until last year, when Dr. Brodie, of Toronto, who has been making a speciality of the study of Canadian galls and gall flies, wrote an article for the *Canadian Horticulturist* describing this fly. He tells us that it has been plentiful for the last twenty or thirty years in the county of York, on both cultivated and wild varieties of raspberries. The only reason why this insect does not completely destroy our raspberry plantations is the fact of its being kept in check by parasites, and, in Dr. Brodie's opinion, the encouragement of these is, in almost all cases, the true way of keeping in check the harmful insects.

The illustrations which follow were drawn from life by Miss Violet Brodie, the doctor's daughter. Fig. 3 represents one of the galls as it appears on the raspberry bushes. They are over two inches long and three-quarters of an inch in diameter, covered with short prickles and of the same color as the bark of the cane. If these are collected the second season and put in a bottle the gall flies will emerge about the middle of May and may be seen walking on the side of the jar next the light. Fig. 4 represents the insect under consideration, which is known to entomologists as *Disastrophus Turgidus*. The doctor describes them as short and chunky, the head and thorax black and the abdomen reddish brown, flattened laterally and rounded.

Fig. 3.

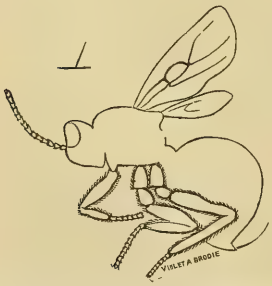

Fig. 4.—The Gall Producer.
(*Diastrophus Turgidus.*)

Fig. 5.
Parasite of the Gall Fly.

The most numerous parasite, he says, is Torymus, which is of a coppery, brown-greenish color, with a long ovipositor. Fig. 5.

The next most numerous parasite is the *Ichneumon*, Fig. 6, with head and thorax black, and abdomen reddish, blackish toward the end.

Another parasite is the *Ormyrus*, fig. 7, which is uniform black color, the thorax punctured and rough, and the abdomen smooth, shining and pointed.

FIG. 6.—ICHNEUMON FLY, Parasite of the Gall Fly.

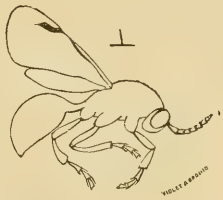

FIG. 7. A SPECIES OF ORMYRUS.

These parasites should be encouraged and by no means destroyed, and by their aid this insect will be probaby so kept in check as never to become a formidable enemy to the fruit grower.

In connection with this Raspberry Gall, we may notice another Gall not often described in public print. It is the Pithy Gall of the Blackberry, and the producer is a near relative of the Gall Fly. It is known as *Disastrophus nebulosus*. Fig. 8 shows one of the Galls which it produces on the blackberry canes. If these are cut open transversely, they will be found to contain a number of oblong cells, each about one-eighth of an inch long and containing a single larva. The perfect insect appears in spring and is about half an inch long, black, with transparent

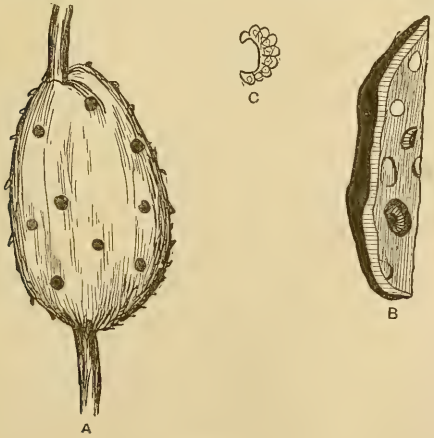

FIG. 8.

wings, and red feet and atennæ. The parasite insects prey upon this, as well as upon the Raspberry Gall Fly. A sample of this was sent us by a correspondent.

Time and space would certainly fail us were we to enumerate a full list of the fruit grower's insect enemies; the stem and leaf of the grape vine, of the apple tree, and a long list of small fruit plants are all subject to the ravages of numerous destructive insect foes, some of which are easily dealt with, and others so difficult that to overcome them is still a difficult problem in our road to success.

In view of all this, we feel the necessity of appealing to our professional friends, who are students of science, to aid us in solving our problems. Already we practical men are much indebted to scientists for the practical turn which they have given their investigations, and we venture to hope that, in the near future, they will place us under still deeper obligations along the line here indicated.

GEOLOGICAL NOTES.

Read before the Geological Section of the Hamilton Association.

BY COL. C. C. GRANT.

NOTES ON OUR LOCAL BUILDING STONES.

It was suggested a few months ago that some notes on the rock material used in Hamilton for building purposes might prove acceptable to the public, if not to our own section.

I had some doubts on this point, feeling many various interests were nearly connected with it, however important the matter might be.

One frequently hears the view expressed that our Niagara Escarpment (erroneously called the mountain) furnishes *very indifferent building stone.* The prejudice against it in many instances (so widely entertained) arises chiefly from careless, injudicious selection. Our great drawback here is that the best beds are not easily accessible, and a considerable amount of comparatively useless stuff (chert and shales) must be utilized or got rid of in some way before we reach the more valuable layers underlying the local chert beds, now used for macadamizing purposes. The under portion of the chert resting on the soft shale capping, what the quarrymen here call the "blue building beds," may be, perhaps, used for foundations and underground cellars. It certainly is more suited for such purposes than the rotten material, crumbling shale, which unfortunately is used for their construction too frequently.

Great ignorance prevails regarding the texture and durability of building stones, not alone in Canada but in the States as well. In a lesser degree this may be said of other countries also, but there, take Europe for instance, structures which have existed for ages are available for determining how the material has stood the weathering process, and it can be traced generally to the original place from whence it came. In the Old Country we have learned from experience that *brown sandstones* are not durable *freestones*, even where

no shale seams may be detected. In many consolidated sand beds, the layers become harder on removal. In other instances the opposite takes place, large blocks freshly quarried becoming disintegrated, crumbling away during a night in a mysterious manner. Probably frost could throw a little light on the subject. If the rock is of a loose texture, or shaly, it absorbs a considerable amount of water, and the expansion of this by freezing may sufficiently account for the circumstance. As far as I can learn, this has never occurred in our Medina freestones, so the texture of the stone is of considerable importance in Canada. The grey band (freestone) caps the blue, red or mottled clay on which Hamilton city is situated, is far and away the most valuable stone we possess. The real workable beds average from five to six feet in thickness (deducting the passage beds into the Clintons.) It is generally free from Iron Pyrites, but at certain places beneath the brow of the escarpment this may be occasionally noticed in small patches. This foreign ingredient is very objectionable, as when it decomposes the sulphuret of iron stains the exterior of the stone, thereby causing an unsightly appearance. Many of the public buildings in New York are built of the brown Medina freestones. No worse material could have been selected for the purpose. Dr. James Hall states: "Although little more than twenty-five years have elapsed since these buildings were erected they already present a most dilapidated appearance." This he attributes partly to clay seams in the New York beds, as well as coloring matter. Others from the same horizon become harder, more durable than when quarried, but less acccessible than formerly owing to its position. The cost of removing the overlying shales is increased, the demand too slight, the prices unremunerative and far below the actual value. This quite explains the cause why so few quarrymen are employed here. It is quite possible that in some cases objectionable material may have proved prejudicial also, but it is not always an easy matter to detect injurious foreign substances in rocks freshly quarried. Often the iron stain does not put in an appearance for several days, or the mud and dirt may conceal minute fossils which shine like brass. The base of the Niagaras, known as the *Pentamerus* bed here, usually contains many large shells metalized or impregnated with mineral salts, viz., Iron Pyrites. This is by far the most objectionable layer in the Hamilton quarries used for building purposes. It is injurious, and even when not immediately

destructive disfigures the exterior wall by white or rusty patches. I have traced this rock all over the city, and I may be permitted to suggest that its presence, (together with the indurated Niagara shales—unfortunately also too frequently used) is by no means calculated to impress us with a favorable opinion of our building stones proper, or the dishonest contractors who are ever anxious to substitute the most indifferent material, provided it can be more cheaply obtained. I can never pass one of the churches in Hamilton without regretting that when the original edifice was erected I abstained from calling attention to what led to its collapse and caused the death of a countryman of mine, poor Sullivan, a workman employed there.

The durability of building stone is sometimes tested by submitting 1½ inch cubes to pressure between steel plates. Some rather unexpected results were reached in New York State about eight or nine years ago by experiments of this sort. While grey Gneiss and dark Sienite sustained a pressure of only 22,575 pounds to the square inch, the limestone from the Cobleskill quarries withstood a crush of 27,407 pounds on an average, before breaking. It was also noticed that the same horizon displays considerable difference as regards texture, losing compactness and becoming soft and shaly. In the Upper Clinton green band at "The Jolley Cut" you may notice a thin wedge-shaped layer varying in thickness from perhaps 8 to 2½ inches. At "The Bluff," a little beyond the reservoir, the same bed is three feet or more thick. From the closeness of the grain and its compact texture it may be looked upon as a durable building stone there. Although impressions of Lingula are occasionally noticed on the surface they are not, however, injurious. I think it resists absorption of water in a remarkable degree, as likewise very considerable pressure. I hope to return to the subject of this paper on a future occasion.

May 27th, 1892.

NOTES ON OUR LOCAL BUILDING STONES (NO. II).

When the freestone quarries, viz., the capping of the Medina series below the Niagara Escarpment, were worked some thirty or forty years ago, there were less overlying shales and clays to be dumped than now. This is quite true. The difficulty of obtaining access to this fine building material has considerably increased, while its value has not in like proportion. Here we have (assuming

the correctness of the statement as given by a quarryman) something that throws light on our neglected resources. Valuable and durable as the freestones are they scarcely pay the cost of extraction. The proprietors of the quarries complain that the demand for the material is greatly lessened by the preference given by the stonecutters and masons of the city to imported sandstones, softer and more easily worked into the required shape. Admitting that it is more difficult to dress (the fact points to superiority as regards durability), then why should you, I ask, "City Fathers," Hamilton Aldermen, favor the introduction of an inferior article because an influential body possessing votes "for civic honors" may mar the chances of success at election time? Anticipating objections to what I have already stated regarding the stones used for public and private buildings in this city, I have examined as far as I could, without intrusion, a good many edifices within the limits. Of course the examination was restricted to the portion appearing above the ground (except in a few cases.) I found as a general rule the material was carefully selected, and the absence of destructive agents proved that masons must have taken pains to reject objectionable material, such as shaly limestones, for instance. I have every reason to believe, however, that the same care has not been displayed regarding the foundations. Indurated shale or, in plainer words, hardened mud is too frequently substituted for the basement, because it may be purchased at a cheaper rate by some greedy contractor, than a more enduring substance. I need scarcely remark how important it is that the foundation should be firm and unyielding, capable of sustaining the very great pressure of the superincumbent walls, etc. About two or three years ago I met a mechanic (apparently) at the head of the Jolley Cut, who informed me he had invested a little money in the purchase of a house in Hamilton, and the basement was crumbling away. It proved to be indurated shale, and he gradually replaced it by a more durable material.

In the Clinton beds here there are many layers which may be safely used as foundation stones, especially the upper green band. The hard grey sandstone beds are very compact. There may be a little difficulty in dressing it on that account, though probably not much shaping would be necessary. "Experience has everywhere proved," remarks Dr. Jas. Hall, of Albany, "that the brown sand or freestones are not durable; their destructibility is not only due to

the presence of argillaceous matter, but to oxide of iron. The grey or neutral tinted stones of the same composition are much more durable. A mixture of fine sand grains with pebbles does not usually answer; some, however, may be enduring or little affected by weathering, where Silica is the cementing substance." Every stonecutter knows that all rocks are more easily trimmed when freshly taken from the quarry than after they have remained exposed to the air for any time. I have noticed of late years the freestones are more frequently removed to the city in the rough state than formerly. I presume there is some reason for it which is quite unknown to me.

Placed as foundation stones, beyond the reach of freezing, thawing and the oxidizing influence of the sun's rays, many of our limestone layers can be safely used, which may be considered objectionable in more prominent positions above ground. I have noticed, for example, in underground kitchens or cellars in Hamilton, limestones still retaining unaltered the brassy appearance and lustre presented by the base bed of the Niagara series. If the information received can be depended on, "that it was quarried a fourth of a century ago" the views generally entertained regarding this very objectionable mineral may be slightly modified. When protected from external influences it may not prove to be quite so subject to disintegration.

Although some of the layers above the Pentamerus bed hold large shells (the Stricklandinia of Billings, for instance) they have not been mineralized and present no objectionable features, but the thick limestone bed known to quarrymen as "The Nigger Head," frequently displays pockets filled with Selenite, Baryta, or Earthy Gypsum. Sometimes the mineral matter has been dissolved and disappears altogether, leaving the empty chamber, which adds to the difficulty in shaping the material—even while the cavity is confessedly very slowly enlarged while undergoing the weathering process. I infer from this our Dolomites here are more durable as building stones than the corresponding beds in the States, which have been pronounced more suitable for rough masonry than other building purposes. In the State of New York there are sandstones and limestone of various ages, yet you may perceive from what scientific men admit, that no superiority can be claimed as regards durability except by properly testing. The Amherst freestone so

largely used in New York, Buffalo and the new House of Parliament at Ottawa varies considerably in its character. Dr. Hall states that at different points along the outcrop of the formation our earthy Hæmatite or Clinton Iron band, as we noticed recently, changes at Grimsby into a red and mottled sandstone. Granites, considered the most durable for building purposes and displaying no inherent cause for decay, will show sometimes quite unexpectedly a strange want of cohesion on the quartz, Felspar Mica, a little way off, as in this instance of the specimen now produced, which may easily be crushed in your hand. The decomposition may be due occasionally in this class of building stones to the weathering process, affecting large felspar or homblende crystals. Iron Pyrites, finely disseminated, also occur and are frequently the cause of destruction in the gneissoid and granite rocks. The famous Kaolin clay of China is merely decomposed felspar. No doubt the instructive and exceedingly interesting paper on "Pottery," by Professor Ireland, Principal of the Art School, is still fresh in our memories.

I understand that the limestone of the Barton Niagara rocks at Lime Ridge, behind the Mountain View Hotel, are coming into use for building purposes. It may prove difficult to dress, but it seems well fitted for the heaviest structures, possessing great strength and powers of resistance to pressure. The upper or glaciated layer should only be used in basements of houses. It contains large numbers of organic remains less durable than the enveloping dark material, which slowly but surely would disappear if exposed to weathering.

Since the great fire in Chicago many have become impressed with the idea that brick resists intense heat better than limestones. It is said the Niagaras used for buildings in that city were saturated with crude petroleum like many of the corniferous limestones of Ontario Granites which are used for lining kilns will stand any amount of heat. The surface becomes glazed. The pre-historic vitrified forts in Ireland, built without mortar, erected more than 2,000 years ago, seem indestructible. No better material could have been selected than the massive freestone blocks recently used in the construction of the Incline Railway.

The color of a building stone may be of less importance than its durability, yet it is a matter which cannot be well ignored, and perhaps too little attention has been given to our surroundings. Nature has done much for Hamilton. "The suburbs and City of

London give one the idea of a people emerging from barbarism," remarked an English friend of mine, "but I never noticed anywhere such an offensive aspect as the numerous glaring red brick houses presented to one's view here; and you cannot be congratulated on the dull, sombre, cheerless coloring of much of the material used in more pretentious public edifices." It may not be flattering to our taste, yet it is better for us to learn what others say of us.

My friend Mr. Neill (our Vice-President) recently suggested that I may have overlooked the circumstance often noticed that when cold water from the hose is thrown on burning buildings, the hardest freestone is apt to fracture, as he noticed when the McInnes block was gutted by fire some years ago. I do not think any stone, not even igneous Trap would successfully resist the combined action of fire and water under similar circumstances. In prehistoric time the Mound Builders, (or, perhaps, the ancestors of the American red man) discovered that water flung on heated rocks caused them to disintegrate. Dr. Spencer, F. G. S., when employed as a mining engineer at Lake Superior, informs us the Mound Builders sunk pits in the solid rock fifty feet deep, also drove galleries in the mines by heating the stone to a high temperature and throwing cold water on it, which caused it to crack. The original inhabitants of the Malay Peninsula 2,000 years ago, quarried tin in the same manner, and charcoal is frequently found, together with such heavy stone sledges and hammers as at Superior, in ancient Irish mines. Dr. Spencer clearly proves there is no foundation for the assertion so frequently heard that the American red man had no knowledge of the native copper mines when the whites arrived here.

Sept. 30th, 1892.

NOTES ON GRIMSBY EXCURSION, AND THE SILURIAN ROCKS IN THE VICINITY.

Disappointed at the absence of an old friend and brother geologist at Grimsby, on enquiry from an acquaintance, I was informed the water was so high, owing to the recent heavy rain, that I would find it perhaps impossible to proceed to the first "fall," much less to the last one, if I had any intention of reaching them through the rock bed. Under the circumstances I concluded it would be better to judge for myself. With great difficulty I suc-

ceeded in getting some few hundred yards up stream, when I arrived at a place which was utterly impassable. I had reluctantly to return to the station. Here I ascertained the entire party had gone off a little while before in the direction of the Ravine. I failed to overtake them, and as I had previously ascertained that all the ladies had taken to botanizing or "butterfly-hunting," I naturally concluded I would see very little more of our recreant section on that occasion, so I turned my attention to the Quarries, hoping to intercept a stray member on his return, and induce him to assist in conveying to the railway station some of the best specimens obtainable. Unfortunately the majority of the excursionists passed over to the other side of the stream and returned by another way, and a few, detained to witness the remarkable preservation of some of the Fucoids, could scarcely be expected to volunteer their removal when already in possession of baskets of provisions, ferns and plant cases, with various other things.

A paper on the Silurian Rocks of Grimsby must necessarily be incomplete owing to the difficulty of a proper examination. There is a fair exposure in descending order of the Niagara lower shales, the old Clinton (Niagara limestone), the Clinton upper green and Iron bands, in the quarries. The remainder are concealed measures except in the brook bed. The shales, unlike ours here, are very fossiliferous, and interspersed through the softer clays are thin limestone layers containing many Brachiopods, Coral and Bryozorus. On one of the slabs before us you may notice the beautiful little *Eichwaldia* of the late Professor Billings. It occurs also in our local chert, but rarely; the coarsely ribbed Spirifira Sulcatus is also common to both. No collector in the neighborhood of Hamilton has been more successful in obtaining such a varied assortment of organic remains from what we call in the old country the "Wenlock series" than my indefatigable friend of the olden days, Mr. J. Pettitt, but unfortunately few were figured or described at the time of the original discovery. The extensive collection of Cambrian and lower Silurian forms in the Museum of the Canadian Geological Survey Office were almost unknown outside this continent, and I am quite satisfied now that Professor Billings acted wisely in confining his attention chiefly to the study of our oldest organic remains. His training as a lawyer was not time wasted, since it taught him to pursue

his researches in a more systematic manner and much more carefully than is generally done by scientific men. Owing to a well understood rule among geologists that *no organic remains unfigured and undescribed are recognized*, Mr. Pettit lost the credit as the original collector of many fossils subsequently claimed and acquired by others.

Rhynchonella obtained at Grimsby (here submitted for inspection) is probably not represented in the Niagaras near Hamilton. It is usually found in a somewhat crushed condition and this is the only fairly preserved one I succeeded in extracting. On one slab it occurs associated with orthis hybrida. Evidently someone must have previously noticed it, for in some places the thin limestone layers around had been collected and placed face downwards to conceal the Corals, Bryozoras and shells on the surface. 'Tis an old trick on the part of collectors to hide from curious eyes specimens which cannot be conveniently removed, but hard, thin beds occurring in shales are usually fossiliferous and never should be passed by without close examination.

Few field geologists would imagine that the upper Red Clinton Iron band in rear of the Reservoir, near Judge Robertson's, is represented at Grimsby by red and mottled sandstones, rather soft and loose as regards texture. Some of the recently erected houses there are built of the material—I would not suppose it a durable building stone. The colored Lingula bed, of Hamilton, puts in an appearance in the shape of a liver-colored freestone, the Brachiopods were numerous, but in indifferent preservation. The green layers or greyish sandstone below the Niagara limestones there present some fine specimens of the singular fucoid Arthrophycus Harlani. I wish some of my friends, who doubt that it represents a plant at all, had had an opportunity of examining some of the large massive blocks, unfortunately too heavy for removal, from the ravine at Grimsby. The tufts or branches proceeding from the main stem are sufficient to show that Credner is not mistaken regarding the nature of the impression. Other plant remains, not displaying the peculiar marking of Arthrophycus, may prove to be identical with an undescribed one from the same horizon here. I regret I failed to obtain a portable sample. We have not ascertained, as yet, the limits of our local Chert beds. That they extend as far as Grimsby is rather questionable. I never succeeded in tracing to their original place the

very few pieces of weathered impure flint, formerly found in the bed of the brook. The freshet barred investigation in that direction, and however enjoyable the magnificent scenery and trip may have been, our section can scarcely be congratulated on its success.

List of Fossils Seen or Obtained at Grimsby.

GREY-BAND MEDINA.

A Casteropod (new probably), not unlike a cast of Strophostyrens Cyclostomus, but no other marks on shell.

CLINTON.

Fucoids.—Arthrophycus Harlavi.

Fucoids.—Undescribed: Lingula Oblonga, Bucanella Trilobata, Liphrentis—Sp.

NIAGARA.

Plates—Caryocrinus Ornatus, Stephanocrinus Augalatus, Pentamerus Oblongus.

A Circular Brachiopod (not a phosphatic shell) undescribed. Orthis Hybrida, Orthis Elegantula.

Athyres Intermedia, Athyres Naviformis, Eichwaldia, Cælospira Despiralis, Spirifera Sulcatus, Spirifera Crispus.

Rhynchonalla (three species), Coscintumproavium, and many Bryozoons, and small corals, including "Sticktopora."

June 11th, 1892.

NOTES ANTIQUARIAN AND GEOLOGICAL—NO. III.

It strikes me as being rather singular that the red men who formerly lived at or near this place (Hamilton) rarely used our local Chert for spear heads, arrow points or other implements. One would imagine that where this material could be so easily procured it would naturally be utilized for war and the chase as well as for domestic purposes. Such, however, was not the case. I have examined several hundreds submitted for inspection, independent of quite a large number personally collected, and I find in nearly every instance the material is foreign to this locality. Indications of their manufacture here are not uncommon. Incomplete specimens as well as lumps of flint are sometimes met with in ploughed fields, the latter

showing plainly where chips have been broken off to form the required implements.

In the Archæological report of the Canadian Institute by D. Boyle it is stated that the township or neighborhood of Bertie was apparently a place where the Indians (the Neuters apparently), manufactured the flint implements they bartered with other tribes. It is not by any means an easy matter to trace this mineral to the original source. I have frequently noticed it in the Post Glacial Drift of Western Ontario, variously colored, while all of it, or nearly all at least, was probably derived from the cherty limestones of the Corniferous (Devonian) series. I have seen some points of jet black hornstone from Mr. Kerr's farm at Barton and others in a fragmentary condition from that locality, bearing a near resemblance to the water-worn rounded flint occasionally found along the southern shore of Ireland, which may have belonged originally to the chalk formation in England. I have not remarked anything like it in the Devonian rocks of Canada. Some years ago a large tree was uprooted on Mr. Heaven's property at Boyne (between Hamilton and Milton.) In the clay underneath several arrow heads were discovered, four of which he kindly gave me; two of them are hard white flint. They may have been brought from a distance, obtained either in war or barter. I ascertained that at a comparatively recent time a small body of Indians were encamped at Lime Ridge when the first white settlers arrived here. There is a never-failing spring near the sloping ground where their tents were pitched. In the bed of the stream, a small one flowing from it, I found abundant evidence it was here they scaled and prepared the fish for cooking they had taken in the lake. The numerous scrapers lying about proved the natives frequently used for the purpose any flint flake, provided it would be suitable for the purpose. Many of the so-called "Palæolithic" implements gave me the impression that they were merely tools manufactured by poor or indifferent workmen for some temporary purpose. Side by side you may often pick up in a freshly-ploughed field, after rain, a highly finished flint scraper or arrow point, together with another so rudely manufactued that if discovered in Europe it would be pronounced undoubtedly *Pre-Neolithic.* Many may be failures thrown away in disgust, yet I sometimes doubt when I observe an isolated flint flake, presumably of human manufacture, that it may have been used

exactly for a similar purpose to those carefully prepared "scrapers" you may perceive in almost every collection of Indian relics in Canada and the United States.

In order to form some independent opinion I recently requested two well-known dealers in New York to furnish me with about a dozen specimens of the arrow points they collected. Strange to say I found the majority were composed of quartz, pure and unadulterated. How such a substance could have been reduced to the shape presented is completely beyond any knowledge I possess. So I must leave it for our university professors to shed some light on the subject. For my part I have always remarked how willing they are to help a lame dog over "the stile."

Both at Lake Medad and the places where small bands of the natives were seemingly encamped—Lime Ridge, and the Kerr property, near the city, for instance—I noticed a considerable number of the shells of the River Mussel (*Anadon*) and kind, very much decayed. No doubt they were frequently used as food, only fragments of the thick portion, the least destructible, were remaining. Indian bone implements, awls, needles, etc., are exceedingly rare. Several, however, have been found in the Medad ossuaries. It is not probable that many articles of this material would survive more than a few year's exposure, unless embedded in clay, or otherwise protected from the weather. The same may be said of such as were formed from the horn of the Wapeti, whose antlers are sometimes turned up by the plough greatly decayed.

Shortly after the Jolley Cut road was opened, a land slide on a small scale occurred below it, revealing the horn of a young deer sticking out of stiff yellow clay, in fine preservation. It appeared to me to be about two feet below the surface soil, but this I could not determine as exactly as I desired. A depression may have existed originally in the ground and have been filled in subsequently.

Gun flints, I noticed are not often seen in collections here. Altogether, I obtained about half a dozen. One, evidently long used, presented the well-known shape of such as were used in the British Army, before the introduction of the percussion cap, when "dear old Brown Bess" was known in the service as the "Queen of Weapons." A few years ago I picked up a very ill-shaped one beside a rude powder horn. Both, however, may have been made by some early white settler. If by a native, at the time the flint was manu-

factured, the Indians seem to have lost their old-time skill in forming flint instruments. I am disposed to believe that several of the least skilfully shaped were produced more recently than is generally supposed. That rudeness in manufacture is no indication of antiquity has, I believe, already been asserted by others, both in Europe and on this continent. I feel inclined to endorse this opinion, while admitting I may have been influenced by a rather limited examination of the places where such things are obtainable. It is some satisfaction to learn that such an accomplished explorer as Dr. Boyle, a man of much experience in unearthing the burial places of the ancient inhabitants of this part of the Dominion, arrived at the same conclusion long since, viz.: That the Mound Builders of North America were not a distinct race, but merely the progenitors of the red men I already mentioned. The same view is entertained by Dr. Head, of Chicago, who, I am informed, possesses a very fine collection of antiquities from burial mounds and graves in the States.

A recent number of the publication of the Canadian Institute, Toronto, contains a valuable contribution to our knowledge of Indian Archælogical subjects. I refer to the paper contributed by Dr. Boyle. It is to be hoped it may be published yet in book form with the very accurate illustrations accompanying.

The ornamental designs on many of the vases (baked clay) do not show that marked inferiority noticed in similar ones obtainable from Celtic burrows or burial places in Europe.

The Local Government of Ontario deserve much credit for the liberal annual grant to the Institute. The capital of the Province is entitled to what she receives, and while we willingly accord that and other things that might be urged, I think the Hamilton Association may also prefer a slight claim to some consideration from our Local Government. We cannot but regret that some of the most interesting Indian relics now gracing the cases of the Canadian Institute were transferred from Hamilton to Toronto. Such things latterly have risen considerably in value. Farm hands and boys are not slow to find out that good prices can now be obtained for many things they little valued a few years ago. A certain value is attached to-day to what could have been obtained at a trifling expense formerly. This in a great measure is owing to the Toronto Institute being enabled, through the Government grant, to

offer prices that private individuals cannot afford to make. Much might be accomplished if we had even $100 a year to expend in the purchase of Indian antiquities, etc., for our Museum cases. Perhaps it would also enable us to procure for comparison some few remains from the Ancient Forts and Mounds of Ohio, Iowa, etc. A few years ago a most important discovery was made in the latter state. Two stone pipes were unearthed close to the same number of skeletons placed in a sitting position, faces towards the East. The figure of the mastodon carved on the elephant pipes proves beyond any reasonable doubt that the owners lived at the same time as the mammalian.

Our collection of Indian relics at present cannot possess many objects of attraction to anyone who takes an interest in antiquarian research. One solitary case (only partly filled) silently appeals to every member to endeavor to make it more worthy the Association. Friends have already contributed some valuable objects: Chief Brant's inkstand (of great historic value to Ontario), the Totem, or Turtle Crest, of the Mohawks, (leaders of the great confederacy or Six Nations) is likewise of much interest, as well as some other things I need scarcely refer to, presented to us, and which I feel are much appreciated by some few of us at least. "These Relics," remarks Sir A. Geikie, "are in a sense more valuable than men's bones would have been. While they afford us certain testimony to his existence, they give us at the same time some indication of his degree of civilization and employment. His handiwork thus comes to possess much geological value, his stone hatchets, flint flaker, bone needles, and other pieces of workmanship are to be regarded as *true fossils* from which much regarding his early history has to be determined." Dr. Jas. Hall and Dr. Selwyn, Director of our Canadian Survey, recognized this fact several years ago and long before it was so emphatically expressed by the distinguished Director of the British Geological Survey.

A flint scraper from the Ohio Mounds, presented by our late Vice-President, Mr. Moffat, is superior to any I have seen, as regards finish.

Oct. 28th, 1892.

AULOCOPINA—BILLINGS, 1815.

Canadian Naturalist, N. Series, Vol. 7, Page 230.

Mr. Billings describes the genus in an article on some little known fossils from the Silurian and Devonian rocks as follows: "Generic characters: The larger or upper extremity is more or less concave with a small circular space in the centre, which appears to be the mouth of a tubular cavity that penetrates inwards and downwards, along the vertical axis of the sponge. I shall call it the osculum. From its edges numerous small irregular (sometimes branching) ridges radiate outwards in all directions from the surface and descend the sides of the base. Several polished sections through the osculum downward show that the centre at least in the upper half was occupied by a large tubular cone with smaller ones branching from the sides outwards and downwards. This structure is only indicated by the dark-colored material which fills the canals, in contrast with the light grey chert which constitutes the mass of the fossil. The genus somewhat resembles *Aulocopinum* in its structure, and differs in having its whole surface covered with rounded irregular ridges above mentioned."

AULOCOPINA—GRANTI.

"1. One of the specimens is sixteen lines in length and twelve in width about the middle. The osculum is a little over two lines in width. There are in general from five to nine striæ or ridges on the surface, in the width of three lines. These radiate from the osculum and sometimes down to the base so that its surface is covered with them.

2. Specimen somewhat compressed.

3. Summit of a large individual.

4. Fragmentary specimen, two inches in diameter, occurs at Hamilton, Ontario. The most perfect is of an elongate oval or pyriform shape. I propose to call it Aulocopina and dedicate the only species known to me to Major C. C. Grant."

FROM DR. HEAD'S NOTES.

Mr. Billings made no reference to the microscopic structure of the genus, although he knew that subject was becoming of prime importance in the study of the organism at the time he described it.

The assignment of Aulocopina to its proper position in the system of sponges is entirely dependent on its skeletal structure.

The genus is not confined to the single species described by Billings, but is widespread in pattern. Numerous variations within the genus have more recently been found, and in the opinion of Mr. A. E. Walker, who is versed in these fossils, several fragments obtained by him indicate that one or more stalked or branching forms are to be included, which are of *polyzoon* character. All the specimens found are weathered out of the rock, but are partially attached to or covered with a tenacious material peculiar to the sponge beds. The adhering substance consists of fragments of specules and earthy matter, which appears to have mixed in with the sponge-flesh of the organism at the time of its burial, since which time the present adhering material has become a place suitable for the accumulation of considerable sub-oxide of iron, and tenacious matter mixed with particles of silica.

In the Museum of the Hamilton Association there are several different forms assigned to the genus Aulocopina, (possibly correctly referred) some of which are extremely similar to *Eospongia Billings* and some very like the erroneously described sponges found in Illinois.

Examples of this species do not invariably have the striæ in ridges on their exterior as referred to; their absence, however, is not to be regarded as of specific importance, nor do all oval examples of the species indicate the Osculum as plainly as intimated in the specific description. In some specimens no trace of any true Osculum can be found until a section is made of them, and being globular or ovate the upper cannot be distinguished from the lower part of the fossil. The species proper is "astyloid," evidently sessile, free, and in its lifetime could exist on the sea floor almost as well in one position as in another. This species should not be regarded as the type of the genus, but as the best species that had come to the knowledge of Mr. Billings. His enumeration of its generic character shows plainly the necessity of a better definition. Some of the parietal characters are fairly entitled to separation.

Nov. 25th, 1892.

NOTES ON SOME FEW FOSSIL ORGANISMS. NO. I.

In his Monograph on the Quebec Graptolites, Dr. Jas. Hall, Albany, states: "A large proportion of the organisms which come under our observation, for the purpose of study, are fragmentary. It becomes of importance to know the general character of the form and mode of development of the Cellules, formed by budding from the side of the common body, not unlike many Sertularians." When the foregoing was written it seems to have been a generally accepted belief that this extinct type of the Hydrozoa was confined to muddy or shaly sediments. The extraordinary number discovered at Quebec by the officers of the Canadian Geological Survey confirmed an idea previously entertained. Scattered specimens of the Polypi had been noticed in Europe some years before the organisms were laid bare in the Lower Province, but great difference of opinion prevailed among palæontologists regarding their classification, as a matter of course. This you may perceive from Dr. Hall's allusion to the various ideas published on the matter. In a few instances the slaty shales, Quebec group, revealed the initial point, or radicle, together with the Cellules. Such, I may say, are almost unknown in the softer sediments of our local Niagaras of Hamilton, as well as in the harder limestone beds (known in the States as the old Clinton beds), underlying the thick layer which Dr. Hall and others consider *the base of the formation proper*—that is, if any separation exists between the Niagaras and the Clintons, or Medinas, below. No doubt the distinction is very convenient. If all were merged into one common name, as suggested, would collectors understand what fossils, now obtainable at well-defined horizons, were required by distant European and other correspondents? When we know the foreign equivalents of our own rocks, we see at once what is wanted.

It is only when we come to our local Chert-band that we find additional light thrown on at least some of the forms described and figured in the Canadian Monograph. Dr. Hall regretfully states: "The numerous Graptolites described by myself, and the writers enumerated, were for the most part in a fragmentary condition." The position of the Cellules and the radicle form of the Niagara Inocaulis and Dictyonema were apparently unknown until the discovery of both in limestone at Hamilton plainly revealed one or more species, in the former possessing a

bulbous root, and Cellules over the face, not sides of branches, as was supposed. The other displays in some instances, at least, spreading rootlets, or a funnel-shaped base with the Cellules well marked on the surface also, when the corneous film or test has disappeared (scaled away) in the impure flint macadamizing beds. I have already expressed regret that Dr. Spencer, now Director of the Georgia State Geological Survey, has apparently abandoned his intention of describing the new material obtained since he published his papers on "New Niagara Fossils, Hamilton, Ont.," many years ago. It is to be hoped he may see a way to complete a work of much general interest, if one may be permitted to judge from several enquiries regarding the publication.

I received from an old correspondent of mine, one of the fellows of the Royal Geological Society, London, some time since, the Cambrian Graptolite *Oldhamia Radiata*, found at Bray Head, Ireland, with an intimation that considerable doubt existed regarding its nature; in fact, more than one palæontologist had expressed an opinion that plastic clay, under pressure or through shrinkage, sometimes presents such an appearance as the specimen in the parcel assumed. The branches, mere stains on the matrix, radiated from a well-defined central point. The bituminous Epitheca, generally characteristic of the family, was altogether absent; however, this is not very unusual, as I have already mentioned. The conclusion finally arrived at was that the specimen I received was no true Graptolite; it resembled more the spreading rootlets of an Alga, or sea plant, and I thought it decidedly organic. I heard nothing subsequently respecting it. Hugh Miller, in one of his works, alludes to Oldhamia Antiqua, I think, as an Alga. Dana in "The Manual of Geology," 3rd edition, page 179, figures under the head "European Cambrians" *Oldhamia Antiqua*, *O. Radiata*, adding on the following page (fig. 276) a species probably vegetable, found with Oldhamia Radiata, Bray Head, Wicklow, Ireland.

The Class-Book of Geology, by the Director-General of the United Kingdom Survey (Dr., now Sir Archibald Geikie), was, I think, wisely selected as the text book of the Ladies' College in a branch of science which has few supporters among the churches. On glancing over the work I ascertained that the nature of the Oldhamia remained even yet undetermined—the author stating the puzzling organism has been variously referred to the Hydrozoa,

the Sertularia, the Polyzoa, and the Calcareous Alga. If the illustration given at page 321 is reliable, it certainly bears a marked resemblance to one of the Niagara Graptolites described and figured by Dr. Spencer, Acanthograptus. The spiny process is absent; however, that was not likely to be preserved in shale. The scabrous stems of Inocaulis Plumulosa (Hall) are generally quite smooth when found in the same material. "The clearing up of the affinities of a single doubtful fossil is never barren of good results," remarked the late lamented palæontologist, J. W. Salter, "since it may tend to throw light on other forms as little understood." At an early stage it may be noticed the young Graptolite appears to be furnished with Cilea, like the sponge. The examples given by Hall probably represent a later stage of growth. Admitting that this is an age more for the collection of facts than for their elucidation and explanation, I have always endeavored to let the fossils speak for themselves, rather than put forth views which ultimately may prove to be erroneous, and, when I venture a little beyond, I may honestly say my intention has ever been to attract the attention of others far more competent to judge.

Dec. 22nd, 1892.

RECEPTACULITES.—NOTES IN CONTINUATION. (NO. II).

The Zoological position of this family group is also one in which much difference of opinion exists. Nearly all the leading palæontologists of the age since the time of Goldfuss, Hall, Echwold, Roemer, Salter, Carpenter, Bradley, etc., and other eminent men, have had something to say regarding it, and yet the classification remains undetermined—Formanifera (order) Orbitolitidæ family —Salter and Carpenter say. Bradley claims it as a sponge, and while Billings, who has evidently closely studied the matter, appears to favor this view he does not seem to have quite made up his mind regarding it. Witness his concluding remarks: "When we consider that the full grown and adult individuals of many of the long extinct tribes of animals never attained in their structure a more advanced organization than that exhibited by the embryos of orders living at the present day, it does not seem surprising that we should find in the Palæozoic rocks a sponge which, although often of large size, never became more highly developed than is the recent genus *Spongilla* when it has only advanced to

the sac-like stage described. It is not intended to assert here positively that Receptaculites is a sponge, or to determine the question of its zoological rank one way or the other." "On the whole," remarks Sir Wm. Dawson, "if not Foraminifera they must have been organisms intermediate between these and Sponges." The claim put forth regarding their alliance to the modern purple organ pipe coral (Tubipora Musica) scarcely calls for serious refutation. For my own part, I think we may leave such controversial things to the final determination of the specialist. Though we may expect no satisfactory result as likely to be reached even in the next century, this circumstance need not prevent us from placing in their hands every well preserved specimen which may throw additional light on organisms whose nature can alone be determined in the study or cabinet of the palæntologist. But while I accord the higher rank to the man who can both name and classify, (university honor men, generally), I think the explorer or discoverer who brings, for the first time, to light some new species or genera, should obtain a little more credit than he usually receives. Not long since, in discussing the nature of these beautiful fossils with a friend of mine, (you may notice a restored form by Billings in Sir Wm. Dawson's "Dawn of Life"), I mentioned that I had obtained a fragment of the inner surface of an Ectorhin in the Niagara here. He evidently considered I must have been mistaken, as United States palæontologists alleged its range was limited to the Silurian Cambrian deposits. I pointed out that we had in our Museum several specimens presented to us by Professor Bell, from rocks of the North-West, of undoubted Wenlock or Niagara age. They had also been found in the same series in Australia, and from the circumstances of their frequently occurring in the drift beds of Western Ontario, especially between Stratford and St. Mary's, in the shape of the inner surface of an Ectorhin, I would not be at all surprised to find that Receptaculites may yet be found, well up in the Devonians of Ontario. (R. Neptune has already been recognized in this formation in Belgium). I willingly admit erratic boulders, shingle and gravel may be derived from beds of *any age*, but the Glacial Drift is chiefly local. I mean by this term, in "a Corniferous district" For instance, you may remark the moved, rounded debris has been torn from rocks in the immediate neighborhood, so, where mountain limestone prevails, (as in parts of Ireland),

I noticed the superficial accumulation, the loosely aggregated masses of sand and other matter, came from places close by, mountain chains adjacent, while many of the transported boulders of the tile have been traced to lands further north than the Ulster Province. "This boulder clay or tile" remarks Sir Archibald Geikie, in "The Class Book of Geology," (1886), "is always more or less *local* in its origin, but contains a variable proportion of stones which have travelled for a greater or less distance, sometimes several hundreds of miles." The stones or rocks in the detritus, more especially when hard and embedded in a clayey matrix, present smooth striated surfaces, the striæ usually running along the length of the stone, but not infrequently crossing each other. This characteristic striation points unmistakably to the slow, creeping motion of land ice. When the wing of my regiment arrived at London, Ont., a quarter of a century ago, I felt assured I was in a Devonian district, although I had not previously seen a rock of the formation *in situ*, and probably 100 feet of boulder clay was overlying. I reached this conclusion from remarking the numerous Corals (Corniferous) on the surface, and the characteristic Shell (Spirifira Mucronatus) Hamilton Shale. The latter (which was in rounded water-worn masses) must have been, as Dr. Chapman, Toronto University, suggested, removed in a frozen state originally, otherwise I cannot see how it possibly could have held together without disintegration. I had no difficulty whatever in breaking it up with a very small hammer, and in obtaining almost any quantity I required. Hamilton shells figured or described are common in the series. This digression may be pardonable in an old collector, for this information may be utilized by younger students of the Geological Section, wherever "drift" is found, from Hagersville to London or Komoka, Ontario.

To return to the subject of my brief address, it is to be regretted that so few of us take much interest in the examination of microscopical objects. The Formanifera, like the Corals from the earlier ages, have largely contributed to building up our globe, yet very little is known about them. The chalk beds of Europe, with a maximum thickness of 1000 feet, are composed almost entirely of minute shells and sponge spicules. Although other fossils may be abundant, they form but an insignificant portion of the vast aggregated mass. The recent deep sea dredging of the "Challenger" proves a like material is still

accumulating in many places at the bottom of the Atlantic—the same conditions apparently existing as in the Cretaceous age. The Globigerina Mud, submitted to the late Dr. Carpenter for microscopical examination, was found to be composed of the minute remains in enormous numbers. The substance itself is a grayish white, not very unlike chalk, or the Eocene Matrix in which we find the small Taliost Clupea Numiles (*Diplomistis*) embedded. When Carpenter remarked the existence of living Foraminifers that were supposed to have become extinct before the Tertiary period, and sponges, sea urchins, etc., of same age, some one expressed a belief that we are living still in the Cretaceous one. The opinion of Dr. Carpenter respecting Receptaculites, ought to have considerable influence in determining the nature of the fossil. No man devoted more time to the structure of the Rhizopods He was universally admitted to be unrivalled in his knowledge of the Protozoa. When Salter, the late palæontologist to the Geological Survey of the United Kingdom, placed the fossil in the family group, Orbitolitidæ, no doubt he was considerably influenced by the figures and description of the large species from Australia and the South Seas by Dr. Carpenter. "I was," he remarked, "possessed of the greatest satisfaction on the above view of the affinity, because on explaining the specimens to Dr. Carpenter, I found that he entirely agreed in it. After pointing out several objections that might be made, he showed me that there was in nearly every point a close coincidence in essential structure between Receptaculites and Orbitolites, the difference only being in the size of the cells in this, the most ancient of the Formanifera." T. R. Jones, another well-known and able naturalist, is also a man whose views must have considerable weight, because he is also looked upon in Europe as a leading expert in minute organic matters. I infer he is quite in accord with Salter respecting the position of the much debated and still unsettled Receptaculites. We may regret the prevailing ignorance in church circles generally regarding geology. It is more difficult to understand why so little is known in the United Kingdom of Great Britain and Ireland, of the important discoveries of late years made on this continent by officers of the United Surveys, and the Dominion Government of Canada. Insular pride and prejudice (as suggested in explanation) may be very dense, but such a charge as this can scarcely be entertained

if applied to such a body as the Royal Geological Society of Great Britain and Ireland.

I may be permitted to call attention to Sir Wm. Dawson's description and figures of Rhizopods in his very interesting work, "Life's Dawn on Earth." Sir William notices the intimate relationship between the Rhizopods and Sponges, however unlike they may appear to us at first sight.

January 27th, 1893.

ANNELID BURROWS, TRAILS, FUCOIDS, ETC. NO. III.

Although I have already alluded to each and all of the above in our local rocks in "Notes on Silurian Plants," still further information is required by correspondents who have had no opportunity of examining any of the original specimens submitted for your inspection. No doubt without seeing the objects, and in the absence of correct figures, it is exceedingly difficult to arrive at any satisfactory conclusion regarding their nature. It may be permitted me to furnish a few additional remarks, even while regretting that circumstances may prevent us from figuring the original specimens themselves.

A well-known fossil botanist in the United States recently requested me to send him copies of some papers on Silurian Plants published by the Hamilton Association, which attracted the notice of a scientific publication in Washington. I was aware considerable difference of opinion existed regarding problematic organisms, so-called, and believing I had in my possession, or transmitted to friends, better preserved ones than are elsewhere obtainable, I was only too pleased to furnish my correspondent with a copy of the first paper on the subject, which appeared in our Proceedings, and subsequently I forwarded a brief description of a few specimens of the late Mr. Billings' Licrophycus (species as yet probably undescribed). These were procured (as the Geological Section knows), shortly after a paper was read at a general meeting, and the additional note was only incorporated in the annual issue as a sort of postscript to the former communication.

The absence of bituminous matter appears to be the chief point relied on for rejecting the Silurian Fucoids as plants at all, no matter how well defined the form may be. Several years ago I produced for the inspection of members of the Botanical Section (as well as our own), specimens of well-

known carboniferous ferns from Mazon Creek, Illinois, U. S., in proof that fossilized flora may be recognized and easily determined, even though the plants may not possess a single particle of carbonaceous matter. The vein-like markings of Neuropteres Hirsuta were as well defined in the matrix (colorless), as the black impressions of similar leaves from the same locality. The fern-fronds from the English Iron Stone, frequently present merely a stain, slightly differing from the muddy deposit in which they were originally embedded. While quartered with my regiment in Nova Sootia, I noticed that the carboniferous plants there always presented the blackened appearance only observable, perhaps, in a majority of cases in the coal measures of Europe and Illinois. Called upon for an explanation regarding the absence of carbonaceous matter in fossilized Fucoids or Algæ, may we be permitted to ask in return, why *scientists* avoid such an absolutely hard nut to crack? Alluding to plants of the coal measures in a very interesting paper on the "Preservation of Plants as Fossils," a copy of which the author kindly sent me, I find an important admission to which I would most respectfully call attention, viz: "Very frequently leaves occur in a fossil state with an *impression* merely, the sandstone shows no traces of carbonaceous matter, but the outlines and the venation are as perfect as if the actual leaf were before us." Again in an abstract of a paper on "Problematic Organisms and the Preservation of Algæ as Fossils," the same writer remarks: "The absence of organic or carbonaceous matter is not considered *per se* to militate against the animal or vegetable origin of many of the forms, but when taken in connection with the absence of definite form, the position of the remains in the strata, and other circumstances, etc." This objection in the concluding paragraph can hardly be applicable as regards our Clinton local beds. No better defined fossilized plant remains have ever been figured on or described (as far as I have seen as yet), as the perfect specimens of Dr. James Hall's Buthotrephis, a Silurian Fucoid, presenting an impression which I, in common with many others, supposed to be a sea plant. I have already stated that a Brachiopod occurs also in the same layer (*Lingula oblata*, *Hall*). This is not the only Mollusc there, and my correspondent, I believe, is mistaken when he states "these problematic organisms are mostly found in strata devoid of other fossils" As regards their appearance,

indicating deposition in shallow water as alleged—this admits of no dispute. If we are in accord with the late Professor E. Forbes, of Edinburgh, respecting the slow subsidence of the mountain limestone rocks in Europe, we need scarcely be surprised at finding here, embedded in Silurian limestones, some few vegetable organisms passing upwards from the underlying Clintons, and accommodating themselves to their altered conditions. These may possibly present appearances in some respects differing from the original parent Alga, as widely as the detached branches or immaturities of the Cambro-Silurian I collected in Anticosti differ from the complete fossilized plant obtained from the local Clinton beds, or even quite as much as the latter seemingly differs from an allied *fucoid*, now in the Redpath Museum, Montreal, which Sir William Dawson named and recognized as a true sea plant in a paper recently published in *The Quarterly Journal*, Geological Society, England, for November, 1890.

I must confess I was unable to comprehend how any reasonable doubts could possibly have arisen regarding the nature of some, at least, of our local plant remains. The Buthotrephis of the Barton Niagara beds, of Sir Wm. Dawson, is undoubtedly less complete as regards form than the one contained in the Clinton flagstones. There we have the root, (conical), main stem, and lesser branches impressed entire to the topmost one on the layer. I am unable to recall any land plant of the coal measures in a better state of preservation. The confounded thing, however, does not present the blackened appearance it should have presented if it only adhered to "the natural law," which, unfortunately it seems to have utterly rejected. There it displays itself on our museum cases in all its naked simplicity, challenging investigation, and ready to convince the most skeptical regarding its nature. When C. D. Walcott was here some years ago, I split one of the large flags for him, and it revealed the smaller branches alternately proceeding from the main stem. I am not quite so sure that the conical root put in an appearance in the interior of this particular layer on that occasion, but I have preserved a single radix from several given away, and as this portion of the Fucoid or Alga is rarely preserved in the Clinton rocks here, I must request that the Geological Section of the Association will perceive it cannot be well dis-associated from the branches of the Fucoid or Alga, named Buthotrephis (Hall), in our cases.

We need not expect to find internal structure in such organisms. Striæ, however, unquestionably in some instances, may be detected even without the aid the ordinary lens affords us. I ask you to pardon the repetition of the description of Buthotrephis I gave, as some few opponents have not seen it. Here we have a conical root buried in a dolomitic shale precisely as it grew—*a main stem* and well defined branches alternating, gradually becoming smaller towards the top. How anything presenting such an appearance can be put down as some obscure organism, a worm track or trail, is what I am utterly unable to comprehend. Even a single branch appears to me to be sufficient to convince anyone as regards its nature ; the very branching itself seems conclusive on the point in question, independent of other considerations. No Annelid, as far as I can see, could produce a trail that bears any resemblance whatever to one of the poorest preserved fossil branches you may see in our cases. I have already placed before the Section, for examination, three species, all probably new, of the genus Licrophycus. All were obtained from the Clinton sub-division, and two of the number since the paper was published on "Silurian Fossil Plants of Hamilton, Ont." One, now in the Redpath Museum, Montreal, presents a tuft or bunch of branches proceeding from a single stalk, (such, however, is usually the case) but in this specimen the main stem is continued through the centre of the tuft, producing another about an inch above it. A far more flexible species (yet in my possession) displays not only a second tuft, but also a third and the base of a fourth one proceeding from the stem. I am unable to comprehend how such an impression as this could represent anything but a plant or fucoid. It may be considered rather questionable taste for an amateur to think famous palæobotanists such as Lasquereux, etc., can be mistaken, more especially with regard to such organisms. A good deal depends on the state of preservation of the specimens examined, as well as their immediate surroundings ; the latter appears to be entirely unknown in many instances, and an opinion formed from imperfect specimens submitted for examination. I find I am near the end of my pages, and have only referred to two genera of plants yet, so you may kindly excuse me for returning to this subject on another occasion.

In extenuation of my offence, viz., unfortunately differing from well-known palæobotanists regarding the nature of some

of the organisms, I may be permitted to relate an anecdote I heard related in my younger days. There was a vacancy for a coronership in the Barony of Duhallow, County Cork, and an ambitious auctioneer, finding business slack, came to the conclusion that he might as well prefer a claim to the coveted office as another, so he called on a county magnate in order to secure his influence in the matter. Having stated the cause of his visit, Sir W. B. was rather taken aback at our friend's cool request, but replied, in the courtly way of the old country squire: "I regret, sir, I am unable to promise you my support. I hold that the office of coroner for the county is of very great importance, and I consider it ought to be filled by someone learned in the law or medical profession—a lawyer or doctor, in fact." "A liar or docthur! Sir William," was the unexpected reply, "Arrah! sure I'd know a dead man as soon as either of 'um." Well, gentlemen, you may permit me to say I possibly can recognize an Alga or Fucoid quite as readily as any professional, when the latter had not an opportunity of seeing the plant in situ, but merely in the closet or study.

In the appendix to that useful and interesting work, "Geikie's Class Book Geology" (1886), at page 479, under the head "Vegetable Kingdom," I find a statement as follows: "Impressions of some of the larger kind of sea-weeds may be left in soft mud or sand; traces of fungi have been noticed even in rocks of the carboniferous period." The concluding part is calculated to lead one to infer that the indications of sea plants presented themselves for the *first* time in the age of the coal measures. Sir Archibald appears to have forgotten that at page 319 he gives us an illustration of a fine, well-preserved Alga (Chondrites Versimilis) from the Upper Silurians. Its position as a plant was, I think, correctly assigned, although it bears a certain resemblance to a Niagara Graptolite of the genus Acanthograptus (Spencer).

"From this incompleteness of the record and from the wide differences in the organic grade of the forms actually preserved in the rocks, we may reasonably infer that only a most meagre representation of the life of the time has come down to us in a fossil state." —*Sir. A. Geikie.*

Feb. 24th, 1893.

ANNELID BURROWS, TRAILS, FUCOIDS, PLANTS. NO. IV.

In a recent paper my remarks were confined chiefly to a few well-marked organisms obtainable here in our Silurian rocks. I endeavored to show some reasons for not accepting the views entertained by several well-known palæobotanists regarding their nature. I have so frequently expressed an opinion that the inferences were formed from mere fragments, poorly preserved, that it seems almost unnecessary to repeat the statement. It certainly would be more satisfactory, to me at least, to furnish specimens from Hamilton in order that my readers may see and judge for themselves. While the best preserved examples may be retained for the Redpath Museum, and the Geological Survey office, Ottawa, yet, no doubt, I can furnish others little inferior from duplicates in the cases of our Museum in exchange for fossils we may require to complete the collection of others foreign to this locality.

Whatever may be the final decision respecting the nature of the above named impressions one thing is certain, it would hardly be accepted as altogether satisfactory if investigation is considered unnecessary with respect to our local fossils. We would rather let them speak for themselves. In a brief notice of "Fossil Botany," by H. Graf Zu Solms Laubach, 1891, it is stated by one of the contributors to *Science*, that the author is non-committal respecting Buthotrephis and its affinities, but he admits Arthrophycus to be a plant. A slight concession is better than none. Credner arrived at the same conclusion many years ago. The members of our Geological Section quite recently had an opportunity of examining for themselves numerous specimens of Arthrophycus in beautiful preservation at Grimsby, (some members of the Botanical Section of the Association were also present) yet not a single individual was found to question the organic nature of the remains, and more than one or two noticed how several of the stems folded over others below them. On the large blocks of sandstone lying at the foot of the quarries you may recollect how much we regretted our inability to remove some of the larger masses owing to the difficulty of conveying them from the ravine for transportation. Yet despite the obstacles which presented themselves, a fair collection was secured by members to enable them to judge for themselves whether such as were observed could by any possibility be referred to *worm trails* or *crustacean tracks*, to both of which they have been attributed. I am unable to un-

derstand why students in colleges and universities are so moulded by their teachers that they rarely depart from the old groove. They are too ready to accept as gospel truths what such venerable sages record for instruction and guidance. Perhaps pardon may be accorded for the digression.

PALÆOPHYCUS.

Although I have already described and given the dimensions of a Palæophycus, from a large block of Barton Niagara limestone, in a former paper on "Silurian Plant Remains," (the original description of the genus by Hall I cannot find just now), I may be permitted to offer a few remarks on fragments of two species before us from the Medina freestone beds. Taking the smaller and better preserved one first, you may notice how boldly it stands out in relief from the surface of the layer. On measuring the stem across, a little below where it branches, you will find it to be about two inches. It then divides unequally, the spreading branch to the right (wider than the main stalk) is more than double the width of the one to the left. The general appearance indicates what is commonly known as a leathery sea-weed. The branches are not in tufts. Compare it with a Licrophycus from Anticosti, Cambro-Silurians, and the difference is at once apparent, although the latter perhaps may have been very distantly related. It is certain there are distinct species or varieties. Some are so poorly preserved that specific determination is impossible, and little can be done in the way of classification until we arrive at a final settlement regarding these problematic organisms. The second example of the Fucoid (and I need not say I consider it such), I now display for the first time. It was obtained in a quarry near the city, a few hundred yards from Judge Robertson's residence, but at the same horizon as the other, which was discovered adjacent to the main reservoir, in an abandoned quarry. I attribute the preservation of the plant remains to their having been covered by a thin muddy sediment before decay set in. This shale, rather indurated at places, varies a little in thickness, but averages nor far, perhaps, from six to seven lines, or thereabouts. I do not believe it is ever absent. There is little difficulty in recognizing the position of what I venture to name the Fucoid bed of the Medina Grey-band. I have hitherto failed to discover the vertical tubes

named Fucoides Verticales, in the series by Dr. James Hall. They are not uncommon in the succeeding Clinton rocks, however.

The paired Annelid burrows seem absent likewise. A cord-like Algæ of the Grey-band is new to me, and is exceedingly rare. Only two specimens have been obtained ; both came from the same locality, and probably are merely fragments of one plant. They were not found in situ, but in a heap of rubbish where stone-cutters had been working. They present an appearance of smooth cylindrical tubes of an equal thickness, lying on the surface of the flag. A closer examination reveals what I hold to be a fatal objection to their being referred to errant worm burrows—they *bifurcate* and do not display the irregular thickness nor the curved shape of Nicholson's Planolites—(*P. vulgares* has about twice the diameter of this). The gentlemen of the Geological Section may remember that I expressed an opinion that many of the vertical tubes named Scolithus, etc., as also the horizontal ones called casts of errant worms, may ultimately prove to be organic, or in other words, to speak more plainly in order to avoid misconception, plant remains. A conclusion opposed to views very generally, but not universally accepted, requires explanation, and the evidence as yet in support of the assertion may not be deemed altogether satisfactory.

The Scolithus of the Potsdam sandstone (Cambrian) I believe to be a true worm burrow. I noticed in a fragment many years ago the U-shaped base of a paired burrow, such as Professor James describes, both ends opening at the surface, as in the specimens from Madison, Wisconsin. No plant, I conceive, could ever have presented a root-like process as here displayed. Arenicolites didymus, or A. Sparsus (Salter), paired tubes with circular openings, are frequently found in the Clinton rocks of Hamilton, and terminate in a like manner, habitations corresponding with those of the modern lob-worm. There are, however, vertical tubes filled in with a muddy sediment (slightly differing from the matrix in color), whose bases are unlike the ones above mentioned. They end apparently in a sharp conical root-like point. Lingula shells (single valves generally) are not uncommon in the beds here. In a paper by Sir Wm. Dawson I find the remark "that many of the filled-in tubes noticeable may have been produced by these Brachiopods." Perhaps the same idea may have been entertained by Professor Shaler, recently, when he objected to the name

"Scolithus," altogether on the grounds (as he quaintly stated), "*since at best, it is only a hole in the rock.*" I infer the professor has a suspicion that the specific name may convey a very erroneous impression, at least in some instances. I do not think it at all unlikely that the pedicle of a Lingula (contractile when alive) was capable of making such holes in the mud and sand. Yet I believe many to represent plants, and I object to the assertion "that no reasonable doubt can possibly be entertained regarding their nature." I spent many weeks last fall in both breaking across and splitting great numbers of the Clinton Iron-band flagstones which were lying about the base of the Niagara Escarpment. In a former paper I stated these layers held several plant remains not true Fucoids, but marsh or land ones; that they generally occur in an erect position as if the muddy sediment had formed around them before decay had set in. The edges of a block in some instances revealed rounded branching tubes. Planes of fracture or joints are found in each flag which separate in three subdivisions. You may split a score without discovering anything exposed on the surfaces but vertical tubes more or less closely packed, some a little larger than others and not essentially differing from Scolithus Verticalis. I had almost despaired of obtaining a fairly preserved specimen, when I concluded to split a few a little beyond, but from the same horizon; the result was hightly satisfactory. Several plants put in an appearance (branching forms chiefly) fossilized in a manner similar to the ones frequently found in the lower Clinton green beds. One is very slender, and so closely allied to a Psilophyton (Lesquereux) from the Cambro Sil—as figured in Dana's Manual—that it may prove a variety merely. Another, a jointed form, displays the main stem and branches contracting at regular intervals after the fashion of the Equiseta (Calamites cannæ formis, for example); portions of the plants are colored green. This is evidently caused by iron salts, etc., for shells and Bryozoons of the band also present the same color frequently. Specimens are submitted for examination. In a paper published in our Proceedings I alluded to a black crushed Fucoid of the Clinton green shales found attached to the under surface of the Pentamerus limestone, the base of our Niagara. It seems more like a flattened reed or rush. I was surprised lately at finding fragments of this, or a nearly allied form, well up even in the chert beds. The best preserved specimen at base is about four

inches long and one inch wide at top, has a sharp conical root and it is considerably curved, so much so that at first it was mistaken for a black Cyrtoceras. It has a roughened wrinkled surface, and in this it differs from the Clinton ones, which are always smooth, as also from the other fragments a little above the blue building beds. Of all the Niagara series I am now collecting examples for Sir Wm. Dawson, who probably may throw a little light on a few of the problematic organisms of our local rocks. The indurated shales of the Barton waterlime beds (Niagaras), display a very large number of vertical tubes of various sizes filled in. These undoubtedly bear a marked resemblance to worm burrows, although one gentleman, a well-known geologist, expressed his opinion that they represented perhaps a Coral Syringopora, or a Monticulipora. The absence of structure is opposed to this, and it appears now an easy matter to establish the vegetal nature despite occasional appearances. Close to the Barton waterlime beds, a sheet of tufa or carbonate of lime has been deposited on the face of a small cliff to which, in places, modern mosses and lichens, have attached themselves. In some instances I noticed the latter plant had been washed off, decayed and disappeared; not, however, before the vegetable acid had eaten its way into the lime on which it grew. It left a perfect impression of itself on the material it covered.

Professor J. F. James, in a very interesting paper he lately sent me, remarks that the outlines of plants (leaves) may be preserved also by what he calls "a chemical process." Even under unfavorable conditions, which he describes, he was enabled to recognize a variety of leaves he enumerates, fallen ones, which had impressed their outlines on flags. They were more than impressions, he states, for they were not washed away by the rain. They were not mere surface markings. May not a well authenticated fact such as this account at least for some of our faint, doubtful plant remains?

Nearly all the fossilized plants in this neighborhood appear to have conical roots—fibrous ones are rarely seen. Since the discovery of a Dictyonema recently with this peculiarity, I feel almost inclined to suppose a mistake may possibly have arisen in at least a few instances where remarked. I had nearly forgotten to mention that I extracted from the ancient lake beach at Burlington Heights, quite recently, a water-worn rounded shingle containing empty tubes of Scolithus, which you may compare with a Potsdam

fragment. The matrix may be Medina or perhaps Oriskanny sandstone. I think it might be derived from the latter, as it seems nearer to it.

Dr. Flemming, a Scotch geologist, a good many years ago described a submarine forest extending on each side Flisk Beach, on the shores of the Frith of Tay, as follows: "It rest upon clay, the upper portion of the clay has been penetrated by numerous roots charged with peat. The peat bed itself occurs immediately above the clay. It consists of leaves, remains of stems, roots of common plants, Equisataceæ, etc., mixed with leaves, branches of birch, hazel and alder probably. Empty hazel nuts are of frequent occurrence. All the vegetable remains are much depressed or flattened when they occur in a horizontal position, but when *vertical they retain the original rounded form.*" Now the concluding part exactly describes the appearance of some of our Silurian specimens here. Any way we may learn from the extract that in our present imperfect state of knowledge it would be injudicious to indulge in rash assertion and hasty generalization. When I find men positively stating "all are undoubtedly worm burrows and trails," as far as I am concerned I am opposed to this conclusion. The entire subject of these "problematic organisms" requires revision and more extended investigation. I am quite sure our Association would not object to loan some of the specimens in our cases to any society or individual in Canada or the United States willing to grapple with, or endeavor to solve the problem of their true origin.

I find from an abstract of a paper by Professor Joseph F. James, which he kindly sent me, that Lesquereux concluded that modern sea weeds seldom retain their structure for any length of time. Matthew, however, thought that although they were not preserved in sand, they were in clay. In the Medina grey-band thin sandstone layer or fucoid bed at Hamilton the muddy shale or silt apparently buried them in places or patches before decay, and so preserved the impression of several fucoids in this favored locality of Hamilton.

In conclusion I feel papers must necessarily lose more than half their interest when not illustrated by wood cuts, photographs, etc. No written description can convey the needed accuracy respecting

fossils, and where the reader and student has not the opportunity of examining the original specimens such things can hardy be dispensed with. The pictured record is an absolute necessity.

March 24th, 1893.

DEFICIENCIES OF OUR MUSEUM.

We are all acquainted with the difficulties encountered by our honored predecessors in establishing, on a firm basis, a museum for Hamilton. Under more favorable circumstances their successors have been partly successful in carrying out their intentions. It is always an ungracious task to point out deficiencies, but where the sole object is to improve on what has been already accomplished, this cannot be helped, so you may pardon me for pointing out a few things worthy of consideration.

Conchology.—In this department we possess some interesting specimens kindly presented by Mrs. Charlton, Mrs. Mortimer, and other friends, but on the whole it must be admitted our collection is an exceedingly limited one. This is the more to be regretted, since shell collecting, Professor Gaskom's *la belle science*, is most enthusiastically pursued by many of the inhabitants here, as I well know. When the British Association visited Montreal a few years ago, perhaps nothing attracted more attention (next to Sir Wm. Dawson's organic remains) than the beautiful collection of sea shells, (now in the Redpath Museum), dredged and mounted by the late Dr. P. Carpenter. It was pronounced the most perfectly arranged one ever seen by leading scientists. Here, as elsewhere, I have noticed sea shells have an especial attraction for ladies. I confess, however, some at least displayed a marked preference for such as had the epidermis removed by acid in order to show the Nacreous lustre. Many of the ones imported into Canada are thus injuriously treated. If ignorant dealers had not equally ignorant purchasers, such a state of things could not exist. If the state of our finances permitted the Council to sanction the appropriation of a small amount as the beginning for the purchase of the types of the different family groups and characteristic species of the various sea provinces, it doubtless would meet with general approval. The Musuem should be made as interesting as possible to all. The public soon tire of looking repeatedly at the same objects. We must keep on acquiring fresh ones to sustain a living

interest in this museum, and although it may be well to have a trifle in hand to meet any unexpected contingency, no advantage can be gained in letting the dollars remain idle while the cases require additions to their contents. Few are aware that a Hamilton lady (Mrs. Carey), possesses one of the best collections of shells I have seen (land and sea inclusive). I have always impressed on our younger collectors that the mere gathering of these things does not entitle one to be recognized as a conchologist. They must be able to distinguish the family groups and arrange them correctly, and further, have some knowledge of their respective habits, geographical distribution, etc. In the majority of cabinets (private ones chiefly) you may find no attempt at classification, but a sort of arrangement where size, color, and such things are the leading ideas. They look better so, perhaps, to an uneducated eye, but it is a very great mistake all the same.

I lately received a small Haliotis or "ear shell" from China. We have heard about painting a lily to improve the appearance, but I never imagined it could have been possible to find any human being who supposed he could improve on nature by plastering this beautiful shell with black varnish, as is the case in the one now before me. Here is a chance for an increase of the revenue, which all naturalists can appreciate. Let the Minister of Finance place a small tax on importations which do not arrive in their *natural condition,* and if some ladies (unlike others in the city) express a preference for a shell when the outer skin or Epidermis is removed, our chemical friends of the drug stores can readily furnish whatever they may require through means of diluted acid. Much as I regret this practice of improving natural productions, if it has to be done let it be done in Canada, not in China or India.

Until recently I devoted but slight attention to the living Mollusca, yet with some little assistance from Professor Whiteaves, of Ottawa, and other friends in Hamilton, I would willingly undertake the arrangement of the sea-shells. I am quite satisfied a collection, classified according to the views of modern conchologists, is an absolute necessity. A great many alterations in family grouping have taken place since Sowerby's famous work was published, new sea provinces have been explored, and great additions have been made to the various species, and unquestionably it must prove of material assistance in the re-arrangement of some of the private cabinets now

located here. As regards the land and fresh water ones of this district, they are unrepresented as yet in our cases. If a beginning were made, the trays (some at least) recently fitted in one of the side cases, may be utilized for their display. I entertain little doubt our young collectors, who are interested in such things, would willingly present us with any they can spare from their own cabinets.

Conchologists can help us by presenting things not required for personal collections. The dead shells frequently cast aside as utterly worthless frequently contain parasites attached (overlooked by conchologists). They are much sought after by others deeply interested in the like organisms of former ages. Parasites unquestionably existed in old Cambro-Silurian seas . I am in possession of a Brachiopod beautifully preserved, with many distinct ones fixed on the exterior of the shells, and Mr. A. E. Walker pointed out to me others which he obtained from the Devonian rocks of Ontario. Organisms thus indicated can scarcely be presented for your acceptance, since they are absolutely necessary to retain by their possessors for actual and accurate study.

While we possess a very fine cabinet of botanical specimens, it is greatly to be regretted the birds of the district (with a few exceptions) are unrepresented. This should not be. It is necessary to have a considerable amount of skill in taxidermy to select the specimens for this department. You rarely find them mounted in a natural way, and frequently, when too late, you ascertain some improper material was used as a skin preservative. I have had some I bought in the Ionian Isles completely destroyed through such means. It would, therefore, be necessary to obtain any things required in this line from some reliable person. Mr. McIlwraith informs us that mounting birds in cases is going out, they never looked quite natural, and the new plan, viz. ; stuffing, so as to represent the dead ones, has several advantages over the old way.

No remarks are necessary with respect to our Butterflies, Insects, etc.; Mr. Moffatt's name is a sufficient guarantee for their excellence in every respect.

Deficiencies in Fossil Cases.—Visitors from other localities would undoubtedly expect to find a better and more complete collection of organic remains, more especially from our local rocks, than we possess. Previous to opening the Museum many thousand specimens were sent away from Hamilton to Europe, the

United States and various places in Canada. We are not the only collectors. Stray professors occasionally pay us a visit, and carry off many interesting fossils. Numbers of the local organic remains have never been described; a public display of such may be injudicious. No department in scientific research can rest satisfied with what has already been accomplished; so let us have a marked improvement all along the line, if possible. I lately received from the city of Bath, England, an account of the annual meeting of The Royal Literary and Scientific Institute there. The society is supposed to have the best scientific library outside London. All the speakers expressed regret that the institution had, apparently, gradually ceased to be attractive. This was attributed by a few members to keen competition, rival institutions, and other matters that had little, if anything, to do with its failure. "Ladies and gentlemen, you require to popularize the whole concern; it must keep pace with the times—must adopt a progressive policy. Weed out your library; provide useful books for reference. *The porter who dusts them once a year is the only person who ever touches any of the works on these shelves*," remarked a member to the highly conservative committee. "You cannot afford to stand still." One old general left the room, it is said, wondering what they were coming to, and declaring he had no intention of remaining any longer where such revolutionary doctrines were openly expressed. There exists no necessity for discarding the valuable works bequeathed to us by their honored donors. Such ought to be retained, but instead of loading our shelves with matter never consulted by any chance, would it not be advisable to select a few useful modern works for reference for our respective sections?

Well-intentioned as the invitation was to open the Museum on Saturday afternoon, few have availed themselves of it. Workingmen can scarcely be expected to do so when it means the loss of half a day's pay. It may be worthy of consideration whether it may not be as well to include Dominion Day, and other holidays as well.

I have always held that Dr. Selwyn was quite right in stating "museums are places not of amusement, but instruction," and no valid objection can be urged to the display of the impressions of the footprints of the Creator and work of His hands on Sundays. I feel in Canada the time has not come for this, but the *London Times*, the organ of middle-class respectability, recently furnished its readers

with an account of a meeting held in that city for the purpose of advocating the opening of museums to the public on Sunday. A resolution in its favor, advocated by Lord Rosebery, was carried; sundry bishops of the Established Church of England asserting that *they could see no harm to religion in so doing.* Surely, when such a progressive movement meets the approval of dignitaries high in the church, laymen may be pardoned for seeing nothing reprehensible in the matter. Are not the works of the Creator as worthy of study as translations of Jewish manuscripts, by men whose ignorance of the Hebrew and Greek languages we may suspect, when we are informed by modern scholars that nearly one thousand errors may be detected in the English version of the Bible alone (unrevised edition). No doubt it would be wrong and exceedingly unjust to deprive the usual employees of the *one day of rest* to which they are clearly entitled, but arrangements may be made which would render this objection of little consequence. As I have already mentioned, unfortunately or otherwise, we are not prepared for a move in this direction yet.

ADDITIONAL NOTES.

The recent discoveries of Sir William Dawson in the erect tree stumps of the coal measures, Nova Scotia, may have escaped the notice of the members of the section. The organic remains were submitted to Professor Scudder for examination, who recognized the following, viz.: Amphibians, twelve species; Land Snails, three species; Millepedes, eight species; Scorpions, three species; Insect, one species.

Celts and their Relics. Since the paper on this subject was published, attention has been called to several points not touched upon. The omission regarding the Sythic origin of the race was quite accidental. I was perfectly aware of the fact of what Major Rawlinson, the celebrated cuneiform Assyrian scholar, had stated, with regard to the Khorsabad inscriptions of the introduction of a strong Sythic element at this period into the population of Central and Western Asia. He showed that the Sacæ (Syths) were always named Tsimiri by the Babylonians and Assyrians—that these were to be found in every province of the empire constituting the militia of the kingdom. Major Rawlinson observed that these nomad tribes included Celts, Slavonians, Teutons. The Zimri, of Jeremiah, referred to the same tribe. The ancient Britons even now call

themselves Cymry in Wales. The name Welshman merely signifies foreigner, a term used by our Norman forefathers.

The Upper Green Band Clinton (so rich in plant remains at Grimsby), which you may notice in the debris at the Incline Railway here, below Mountain View Hotel. Embedded at Cayuga Co., U. S., the head shield of the oldest Eurypterus known to me, one discovered by Mr. Townsend, of Durham Point, was figured and described by Whiteaves, and is in good preservation. It is a Guelph one. Fragments of another, which I obtained from the chert here, were pronounced by Mr. Billings to be doubtful and too imperfect for description. Where this crustacean has been since recognized in the capping of the Niagaras (Guelph sub-division), and below in the Clinton sub-series, the intermediate beds must, as I claimed formerly, surely hold specimens also, although unrecognized.

A New Graptolite from the Corporation Quarry, Hamilton.—Another new form of the above fossil has been discovered here. The greater part of this family group has been described and figured from fragments, and the base is almost unknown In this one, the Radix (root or initial point), is fortunately preserved, it is fibrous, not bulbous, as in Inocaulis. It will come, probably, as regards Genera, under the head Nov. Sp., Dictyonema (Hall).

"*Supposed New Fossils, Niagara Chert-Sil., Hamilton, Ont.*—The Chairman, Col. Grant, produced for the inspection of the section a remarkably well preserved Graptolite, recently obtained from the Corporation Quarry, expressing his opinion that it belongs to the new Genera of Dr. Spencer, F. G. S., F. G. S. A., *Acanthograptus*, Nov. Species of the family first discovered at Hamilton, Ont. He also showed a very beautiful flint-flake fossil from the glaciated beds, stating it may be either a Cornulites, a shelly sea worm, or a *Pteropod*, not unlike the modern *Theca*. He was unable to find anything figured or described by Dr. Hall or others, like it, so probably it may be new to science. Another flint-flake fossil difficult to determine from the state of fossilization, is a *Ptilodictya* (usually supposed to be a Chetætes or Monticulipora), the pores of which are displayed in one specimen. The beautiful *Bryazoon*, *Sagenella Elegans* (Hall) was lately found for the first time here by Mr. A. E. Walker."

SOCRATES AND THE SOCRATIC SCHOOLS.

Read before the Philosophical Section, November 19th, 1892.

BY S. A. MORGAN, B. A.

As a preliminary to all scientific exposition two elements must be definitely present in the mind of the investigator. These consist in a clear apprehension of the logical limits of the subject matter, and a general idea of the sources and method of investigation. It may be well, therefore, before entering upon the consideration of an important epoch of the world's philosophical history, to ask ourselves, what are we to understand by the term philosophy? In what does a knowledge of the world's philosophy consist?

The study of philosophy is a study of man's collective intellectual progress. Man's mental unity and individuality does not constitute an isolation. Having received its life and light from the past, the present age in turn transmits these, stamped with its own individuality, to the ages that are yet to come. To trace the progress of this universal intelligence through its various epochs, as expressed in the life and spirit of the time; to investigate the ultimate principles underlying these various phases, is the special work of the student of philosophy.

When then may philosophy be said to exist? When the human mind, not content with the facts of knowledge alone, begins to inquire into their causes and conditions. When, both in mind and in matter, unity and harmony are seen to exist.

That philosophic germ, which obtained its full development at the hands of the great Athenian philosophers, may be said to have had its origin in the Ionic colonies of Asia Minor, at the time when their freedom was being assailed by the arms of Persia. Contact with Oriental dogmatism at once furnished the analytic mind of the Greek colonist with food for speculative inquiry, the result of which was no less original than unique. This may the better be understood by briefly contrasting the natures of the Oriental and the Greek mind.

The Greek mind was objective and critical, the Oriental subjective and emotional. With the Oriental, reason gave way to the despotic

authority of dogmatism. With the Greek, thought itself was speculative and democratic. Thus, while the Orientals had succeeded in building up elaborate systems of divinity and morality, they were necessarily devoid of any real philosophic spirit. The Greeks, on the other hand, had already by their critical spirit laid the foundations of scientific research. What wonder, then, that this spirit, when brought into contact with the splendor and mysteries of the East, should be led to inquire more deeply into the origin and condition of being.

The first stages of this inquiry necessarily were but an attempt to explain the existence of external nature. This involved two questions: 1. What one principle underlies the changing forms of of matter? 2. How does matter take its rise?

A full description of the theories of these early philosophers would be beyond the limits of the present paper. Suffice it to observe that they constitute but an attempt to discover some material substance underlying the various forms of matter. This tendency of early philosophy was but a necessary result of that adoration of external nature common to all primitive races, but more particularly to those of the East.

The first attempt to trace back the many forms of matter to some form of unity was made by Thales. This philosopher saw in water the simple uncreated substance underlying nature. Anximander followed with his *to apeiron*, the everlasting and divine. This substance, however, was not attributed with spirit or intelligence. Anaximenes saw in air the first cause of all things, and the primary form of matter. "As our soul, which is air, holds us together, so spirit and air animate the universe."

We thus see in the philosophy of Anaximenes the first dawn of a philosophy of consciousness. Thus far, it will be seen, philosophy has been engaged in the futile task of discovering in external nature some ground of unity which in reality exists within the mind itself.

The first to break away from this primitive position was Pythagoras, who saw in number both the form and substance of nature, or rather an identity of the two The chief advance in this was the abstract turn given to philosophic thought, for, in the language of Plato, "Mathematical attributes belong neither to the world of the senses nor to that of pure ideas." The reason of this advance may be found in the contact of early philosophy with

the western races of Greece. A diminished interest in external nature, consequent upon a diminution in her gifts, necessarily resulted in a new phase of philosophy, in which the mind began first to turn from nature in upon herself.

The Eleatics, advancing a step further, broke away entirely from sensuous experience, and saw in the many forms of matter only a delusion of the senses. What is *is* and must always be. The really existing is eternal and unchanging. Multiplicity and change are but appearances and mere opinion.

Heraclitus, following these, goes to the other extreme, and affirms everything to be in a continual flow. The becoming not the being is the only reality.

Empedocles attempts to explain the nature of things by a union of these two theories. He asserts four primitive elements incapable of change. These represent the pure being of the Eleatics. To account for the world of change, he sets over these two moving powers, love and hate, the uniting and the separating forces, and thus introduces into his system the becoming of Heraclitus.

From this latter there was an easy transition to the theory of the Atomic school. These affirmed nature to be composed of indivisible atoms, between which is empty space preventing their contact and allowing motion, thus giving rise to multiplicity and change. This motion is represented as eternal and the result of necessity.

Whatever advance these latter philosophers may have made, and however they may differ among themselves, one element is yet common to all. This element consists in the objective and materialistic nature of their theories. From the earliest philosophers, who attempted to reduce all matter to a single element, down to the Atomists, we find nothing but matter and properties of matter. Two influences were now at work tending to a radical change in Greek philosophy.

One of these lay in the condition of philosophy itself. If, as claimed by the Atomists, the motion of atoms is regulated by some law of necessity, this motion must transcend the material. How then is it to be explained? How may we account for the regularity and continuity of this law? Here we find a new question which philosophy must attempt to explain.

The other influence was a result of the contact of the early philosophy with Athenian life and thought. Philosophy was in-

troduced into Athens at a time when that city was at the zenith of her glory. As to the causes which conduced to the greatness and splendor of the age of Pericles, it is not necessary here to enlarge. It was the age when literature and arts were cultivated with the greatest success. From the highest in the state to the humble citizen who attended the theatre at the public cost, intellectual activity was supreme. Could such a people accept a philosophy, the corner stone of which was necessity or blind chance?

The Gordian knot was cut by Anaxagoras, the father of Athenian philosophy. He placed, instead of the blind chance of the atomists, an overruling *nous* or mind. This was considered as a moving force, ordering and uniting the atoms of chaos. But having succeeded in placing reason above matter, Anaxagoras failed to distinguish reason as particular or universal. This question was worked out by future philosophy in a manner that closely associates it with the history of Athenian life.

Through the greatness of her exploits in the Persian wars, Athens, as we have seen, had become the centre of Greek life and culture. But with this position there had also developed in the mind of the individual citizen a high opinion of his own importance. New ideas of private rights and equality were taking the place of old maxims. This necessarily led to a certain form of selfishness, both in politics and speculation. The result was, on the one hand, the party struggles of the Peloponnesian wars; on the other hand, the negative and individual philosophy of the Sophists.

This exultation of self led philosophy, now turning from external nature and directing itself to the study of a spiritual force, to declare man to be the measure of all things, and thus to set up individual opinion as the standard of truth and right. This tendency of Sophistic teaching soon wrought its effect on existing thought. Looking upon knowledge as being relative to the subject, it at once attacked the dogmatism of all previous systems. These systems, having applied themselves directly to nature, were too one-sided to withstand the pruning knife of Sophistic doubt.

But scepticism did not stop here. The old ideas of religion also came under this new inner standard of truth. The result was that here too, all faith in former dogmas was overthrown. In like manner, old customs and laws were one by one allowed to fall into disuse. While, however, the Sophists were overthrowing all that was

old and venerable, they were, by the individual character of their philosophy, unable to formulate any new system of philosophy. Thus philosophy had now arrived at a point where it must either be consumed by its own activity, or search for some new source of light. This want was supplied by the dialectic of Socrates, or the art of forming conceptions.

In placing mind above matter the Sophists had identified truth with individual opinion. But in doing this objective reality was given to sensuous perception, which rendered impossible any uniform system of philosophy. Socrates, on the other hand, distinguished between individual opinion and conceptions which, being purified by the principle of dialectic, are universally true. It was now required that all the properties of an object be taken into account before judgments were formed; and, by a system of examination, to pass from the individual and accidental to what was universal and necessary. Like the Sophists, Socrates was at variance with the dogmatism of earlier systems; but in addition to this he taught that by a system of self-examination the contradictions of experience might be corrected, until man should arrive at that true knowledge which already existed latent in the mind.

This element in the philosophy of Socrates at once marked its character and its method. By looking upon the ordinary notions acquired in experience as untrustworthy, Socrates was led to suppose that conceptions of the real essence of things can be produced from within, that the soul "possesses from its birth the substance of ideas," and that learning is able to bring these to light. His object then was to aid in developing these germs of true knowledge. This led him to war against all appearance of knowledge, and by accepting the opinions of his pupils to entangle them in a maze of contradictions, until their supposed knowledge vanished. They were then ready to proceed to the attainment of that true knowledge already existing confusedly in the mind.

This phase of the Socratic philosophy also led him to identify virtue with true knowledge. For, since conceptions alone constitute true knowledge, they alone have true being, and are thus the only absolute moral authority. With Socrates, then, no man knowingly does wrong, knowledge is the cause of all right action—delusion the cause of all vice.

The following peculiarities at once present themselves in the Socratic philosophy:

1st. The Importance of Dialectic.—This was a necessary result of the Socratic method of arriving at true inward knowledge or conceptions. By question and answer the delusions of the senses had to be overthrown; individual views were to be brought into universal conformity by means of explanation, and fixed definitions established.

2nd. His Independence of the External.—The external world would naturally present but secondary charms to one who possessed within himself the means of true virtue and happiness. Thus we find Socrates at all times ready to undergo all hardships without complaint, and ever treating with contempt the foolish pleasures of sense.

3rd. His Urbanity.—With Socrates the proper study of mankind was man. He little wished "To muse o'er flood or fell." To understand this we need only recollect that with him the highest work of man was to lead his fellow-men to a true knowledge of themselves, and thus to virtue and happiness.

These three phases of the Socratic character produced three varied schools of philosophy among his successors, known as the one-sided Socratics, or partial systems. Another cause leading to the same result was that while Socrates had set down virtue as the highest form of knowledge, he had not laid down any fixed theory concerning the nature of this true knowledge. It was only natural then that various schools should arise to bring out more fully the different aspects of the perfect Socrates.

THE MEGARIANS.

The Megarian school attempted to unite the Socratic idea of the good to the Eleatic doctrine of real being. Socrates had affirmed virtue to be true knowledge. "But," said the Megarians, "since only a knowledge of concepts constitutes true knowledge, and since reality belongs only to the concept or unchanging essence, therefore the good alone is, and evil does not exist." The Megarians forgot, however, that while Socrates affirmed all virtue to be knowledge, he did not affirm all knowledge to be virtue.

The Megarians further reasoned that "since thought is alone able to attain to a knowledge of the real, therefore our senses can recognize only the unreal or false." This at once brought on a war against the testimony of the senses and the theories of other philosophers. To meet this, the Megarians made free use of the Socratic

irony or affected ignorance. But while Socrates had used it for the attainment of true knowledge, these saw in it only a weapon for the overthrow of opposing theories. Thus, as in the case of the Sceptics who followed later, they finally, by a free use of dialectic, denied the possibility of arriving at positive knowledge, and made dialectic an end in itself.

THE CYNICS.

The Cynics, and after them the Stoics, following the Socratic idea of self-mastery and independence, saw in asceticism the path to true virtue and happiness. Like the Megarians, they followed Socrates in placing virtue in knowledge and in making reason cognizant of that highest good. But, whereas the Megarians had opposed only the testimony of the senses, the Cynics considered it necessary to struggle against the pleasures of the senses. This even led them to treat with indifference the various social ties in which they came into direct antagonism with the urbanity of Socrates.

THE CYRENAICS.

The Cyrenaics, and later the Epicureans, looking at the mental serenity and urbanity of Socrates, saw in pleasure the only supreme good. Like Socrates the Cyrenaics occupied themselves in discovering the chief good for man. Like him they also considered this good to be knowledge. Knowledge then must be the end of philosophy. But since our knowledge comes from sensations, which may be productive of either pleasure or pain, the Cyrenaic asked himself, "to which of these classes would true knowledge belong?" By deciding in favor of pleasurable sensations, he identified true knowledge and thus virtue with present pleasure. We cannot fail, however, to notice how far in this they have gone from the position of the Master, who found present pleasure only in the pursuit of philosophy.

While each of these systems had emphasized one side only of the Socratic character, they had done this to the neglect or contradiction of other essential phases of the complete Socrates. It is in Plato that we find the completion and unification of the Socratic philosophy.

PLATO.

Plato, like Socrates, held ideas to be the only reality, and material things to be devoid of real essence. With Plato, however,

this doctrine of ideas was developed into a philosophic system. If ideas are the only realities, the world of particulars must be derived from these, and, from their secondary nature, are devoid of stability. Thus the world of sense can furnish no real knowledge. Experience is but opinion, and reason is the source of all knowledge.

Since, however, the world of sense is moulded after the pattern of the reality, and since there is plurality in the copy, there must also be plurality of ideas. These, however, must lead up to some higher idea—the idea of the good. To discover this chief good is the highest, the only real work of philosophy. Thus the soul by means of dialectic is able to free itself from the doubt and degradation into which it has fallen through contact with the world of sense, and regain a place more near the divine essence.

The prominence thus given to dialectic as the source of all true knowledge, and the secondary position given to observation and the Natural Sciences, is everywhere apparent in the philosophy of Plato and Socrates, and constitutes the real defect in their system. As an illustration of this, we may take the metaphor of the cavern in the seventh book of the Republic. In this it will be seen how the world of sense is looked upon as incapable of furnishing true knowledge, which is alone found by the soul in the sphere of pure ideas.

Again, consider his view of the human soul. According to Plato, the head of man is a little cosmos, possessing a rational and immortal soul. To this head is attached a body possessing two emotional and mortal souls, one the seat of courage and anger, the other of the appetites and desires. While the higher soul was able to some extent to control these lower, it was itself polluted by their contact, which might finally lead to a degeneracy of the species.

From this we may see that the weakness of the present system lay in the fact that it rendered impossible a scientific explanation of the phenomena of the material world. Dialectic was the Royal Science, and experience a source of delusion and degradation. This defect in the Platonic Philosophy it was the peculiar work of Aristotle to correct.

ARISTOTLE.

Aristotle, like Plato, divided the soul of man in a three-fold manner ; but instead of making them three distinct and antagonistic

members, he looked upon them as three attributes, which may, and in man do exist together. These he named: 1st, the vegetative; 2nd, the sensitive; 3rd, the intellectual. Like Plato, he gave to this third attribute an indwelling principle as the basis of knowledge, but further saw in these lower forms the necessary means for the development of the higher. Instead, then, of denying any real worth to the world of experience, Aristotle found a positive relation existing between the world of thought and the world of experience.

While, then, Aristotle made use of dialectic, it ceased to be an end in itself. It now served the purpose of investigating the world of ideas as found in experience, where they alone exist. While Plato saw reality only in the idea, Aristotle denied existence to the idea except in the particular. Instead, then, of finding the soul to be degraded by its contact with the world of sense, Aristotle saw in this contact the only possible means of developing the potential excellence which it possesses. The results of this physical turn given to philosophy by Aristotle, in the incorporation of Natural Science with the doctrine of pure ideas, may be summed up as follows:

1. From being, in itself, the royal science, dialectic became but a method for the discovery of the universal in the particular, for passing *from experience to knowledge.* It thus became separated from both Ethics and Natural Science, and was formulated into a science of method.

2. Since knowledge was seen to be really dependent on the activity of the mind in experience, and since nature is an ascending scale of life, the Natural Sciences became both a worthy and a necessary department of research.

3. In Ethics, since virtue is the chief good, and since the chief good is the development of the soul by a life of activity, Aristotle made happiness depend, to a certain degree, upon external circumstances. Virtue, likewise, will depend, not on true knowledge alone, but upon the development of the will by a life of activity. Thus virtue becomes subject to external circumstances and habit. The result was the separation of Ethics from knowledge proper.

Thus we see that the peculiar work of Aristotle lay in his uniting and unifying all previous systems of philosophy, in placing upon a scientific and well-defined basis the various departments of thought as portrayed in the manifold character of Socrates.

THE SCIENCE OF ECONOMICS.

Synopsis of a paper read before the Philosophical Section, March 18th, 1893.

BY JAS. T. BARNARD.

Man, the creature of God, is himself by divine appointment a creator and a king. To him has been given mental capacity to plan, and to acquire skill to perform. His abode, the earth, abounds with material on which he must expend his powers to obtain things necessary for bodily needs and comfort.

Man, endowed with life and entrusted with its maintenance, needs this earth. He is an earth-child. From it he has come and to it he shall return, and from it alone can he draw the means of preserving and sustaining the life given him in trust.

Man's right to life is alone supreme on earth. No other animal shares that supreme right with him. Reason and revelation unite in declaring that man is monarch absolute, and that other beings retain life only during his will and pleasure. Man may fell his ox even as he fells a tree and do no wrong. The life of both must be yielded up to minister to man's needs. Killing an ox is not slaying a man, but every Cain is a murderer.

As man's life is an individual possession, so his right to the use of that which alone can maintain and preserve it is an individual right —his birthright, his possession till death. His right to the use of the earth for life maintenance is unassailable and inalienable. This right never trenches on that of all others. The limit of each man's right to the use of the earth is the equal right of all other men. In the matter of life and the sustaining of life, all men are born free and equal.

Equal rights to the use of the earth mean continuous free opportunity to all men to produce according to their mental capacity, strength and manual skill. They mean also that each man has an equal title with all others to the use of the choicest locations or sites. This equality of right is easily and naturally maintained and practically recognized so long as there is an abundance of choicest

sites, the very best for each individual in pursuing his calling. When increase of population makes it impossible for all to occupy choicest sites, and some are compelled to use those that are inferior, then there arises in the face of equal natural rights, unequal opportunity, and the community finds itself at the "parting of the ways," a worse and a better path.

If the better way has been chosen, all continue in the actual enjoyment of their natural equal right, and therefore all can work without paying for permission to do so. As all can work all must labor, for none have power to exact the earnings of others. Existing wealth is in the hands of producers and accumulations beyond individual powers to acquire are unknown. While excessive wealth in the possession of a single individual may therefore be impossible, the production of wealth through freely exerted effort is enormous and ever increases as civilization advances and subdivision of labor becomes general. Because all are free producers none are compelled to yield up their produce to non-producers and therefore wealth is diffused, none lack but the incapable, and they are provided for because humanity is a brotherhood made in the image of God and having natural affection. Because work is free to all, none have an excuse for being idle nor temptation to being dishonest. Tramp production is stifled for lack of that soil (enforced idleness) in which alone it can flourish.

Supply is natural, continuous and abundant, and therefore its correlative, demand, is always active while insatiate man desires. Over-production (more properly lopsided production) is not feared, for all have free play to exercise their powers in any honest exertion and none are tempted through lack of opportunity or of a means of livelihood to overcrowd any industry. Business stagnation, financial crises and commercial crashes are unknown. The evil factor in these disasters does not exist, for natural opportunities, never held out of use are always accessible to the producer, and therefore the fever of the boom and the languor of reaction are alike unknown. While man's inborn desire to excel perpetuates competition, it is always the healthful, generous competition of those who, sure of plenty, yet desire to achieve the best within their powers. Inequality of wealth there is, for there is always unequal power to create it, but inequitable distribution is impossible, for every man is free to make a just bargain for his honest share of the produce. Last, but not

least, there is everywhere time for a fairly earned leisure to advance in moral, mental education, and to train families to higher and better life.

If, unfortunately, mankind has chosen the worse way, some having possession of the best sites can live without producing, simply by exacting from those who do produce, and therefore need these sites. As civilization advances, as inventions multiply, as division of labor stimulates enormously the production of wealth, these site owners, while relatively becoming fewer in number, increase in wealth in proportion to the industrial development of society.

Side by side with this non-producing class is the great army of industrials, professional, mercantile, artizan and primary. These last, driven from their work ground through the holding of sites out of use or out of their reach, are fain to seek employment elsewhere. They force their way among artizan producers, who, to escape the increased competition, seek relief among the mercantiles. These again, through stress of competition also, enter into and over-people the class of professionals. Throughout all these divisions of the great industrial class there seem to be too many men and too much of things produced. The all-pervading and evil competition makes a livelihood generally a precarious boon. They are happy indeed to whom circumstances have assured a competence or a permanent means of subsistence. But these, too, are conscious of uncertainty—that they hold their happy lot by but a slender thread, and this once broken may never again be so fortunately joined. The place they vacate is promptly filled and they find themselves among the number of those constantly seeking employment, but only occasionally finding it.

This uncertainty of employment and success is productive of over-anxiety and worry. Sanatoriums abound and are crowded with mental and physical wrecks—the wounded in life's bitter and incessant conflict. The need for lunatic asylums increases faster than funds are provided for their erection, and they are filled to overflowing, as soon as built, with the permanently disabled; while mortuary statistics reveal the awful fact that suicides—the killed in the same great battle—are increasing in numbers more rapidly than natural deaths.

Besides this seething mass of struggling humanity, there is another and lower class still, the outlaws of society, the tramps of

the country road and the incurably vicious and criminal of our cities. This class of non-producers, as is meet, jostle the other and more fortunate producers who are rich through the toil of others. On Broadways and Fifth avenues, plutocrat and proletariat meet, the extremes of society—both the sorry product of the same crime. The tramp and the thief are graduates of a school, founded and endowed by erring civilization. Only one lesson is taught there, a short, sharp, bitter lesson only too easily learned, only too easily put into practice. "*It is easier to beg or to steal a dinner than to obtain a chance to earn one.*"

Which of these two descriptions of the industrial world is the nearer a true picture of the civilization that is?

The answer to this question solves another.

At the parting of the ways which path did mankind choose, the worse or the better way?

HINTS ON HOW TO SEE PICTURES IN NATURE.

Read before the Photographic Section, November 25th, 1892.

BY T. H. WILKINSON.

As this paper is intended to be suggestive rather than exhaustive, I shall entitle it, "Hints on How to See Pictures in Nature." Before entering upon the subject proper, allow me to say that I feel it an honor to have the opportunity of addressing you to-night, especially on a subject which is of the greatest importance to me, and one which I hope will be of interest and profit to us all. I feel I am speaking to those endowed with the power of a full appreciation of the beautiful in nature, to those that are cultivating the mind and eye to see more clearly the wonderful forms that a Master Hand has shaped and set in order for the eye to dwell on and the heart to delight in. I know of nothing that will so completely arrest the senses, awaken the feelings, and expand the heart with love and gratitude, as a quiet contemplation of nature in some of her more pleasing aspects. Man is not only made to love and admire the works of nature, but he is gifted to some extent with the power to reproduce them. So soon as any of us become penetrated, nay overwhelmed, with the sentiment of a single natural beauty, how energetic are our actions and aspirations. We must see that spot once more. We want to feel that charm again. We long to revive the beauty that gave us so much joy and pleasure.

We each take a different path. One expresses what he feels in music, another in a poem, the painter on his canvas, while you show us these beauties in your photographs.

In speaking more directly to photographers to-night, many of my thoughts will be shorn of their full meaning, because I cannot picture my images in color, and must try to confine my paper to your immediate profession. I feel, however, that I am talking to gentlemen who are not engaged in what we might term ordinary photography, but rather to those who love nature, and in their leisure moments take up their camera and go out to the fields, to the stream, or to the mountain side, not only to enjoy its charms, but to bring back some tangible impression of what nature has provided.

Here let me borrow a thought from Shakespeare, which will serve as a text and also show us how deeply he contemplated nature. He says, "That we may find books in the running brooks, sermons in stones, and good in everything;" and to-night I ask you with me to feel that it is our privilege and pleasure to open these books, read these sermons, and to appreciate the full meaning of their beautiful language.

A very necessary thing to do, I may safely say the most important thing for us, is to try to get in a right relationship with the scenes we may observe.

Remember nature herself is ever varying, ever grand, never tiresome, always in the right relation. Sunshine makes shadow; clouds, gloom; wind, the bending tree, the drifting snow, the scudding sail; rain, the dripping roof, the dreary road, the swollen stream. Winter's snow, summer's sun—each mood has its natural sequence. If we can enter into sympathetic relationship with its transitions, our reward will be much greater. Bear in mind beauty in nature keeps closely sealed to the indifferent gaze, but if you will study and reverence her aright, she will reveal beauties that the ordinary mind little dreams of.

Go with me if you please to any of your streams—look at that large square rock. At first 'tis nothing but a stone; its flinty surface uninviting. But see that delicate grey on the sunny side, observe those tufts of velvet moss clinging here and there; out of its niches the most delicate of tiny plants shoot forth their waxy tendrils—a hundred beauties reveal themselves if we linger inquiringly by its side. How many thoughtlessly pass it by ignorant of it beauties. To them it is merely a stone. These thoughts should simplify many things for us. For instance, you are going to take an impression of this stone, or of a group of such stones, partly embedded in the brook; the water silently gliding by, reflecting their forms; the overhanging foliage mirrored in the crystal waters. Would it be wise, think you, to disturb the sweet tranquillity of the scene by permitting one of your company to sit in a conspicuous position, looking out of your picture with a complacent smile? To lovers of nature and truth you would destroy all feelings of serenity and harmony thereby, and make your photograph merely a cartoon.

Again, I would advise those of you who are giving this pursuit your more serious attention, not to make an exposure unless you

find something worth the plate. While I admit that all nature is more or less beautiful, still I do think there are many things that will not bear a close inspection, and at the same time impart a feeling of pleasure or awaken a profound emotion in the heart. This leads us to study, ponder, and investigate, then, after due consideration of our subject, we decide on the desirability of making the sketch or taking the view, and at once know if it will be pleasing and effective.

To illustrate this point: Let us see how many phases of nature we pass through in following a tiny brook in its wanderings. After the spring source we find it merrily rippling over the small white pebbles, singing just a silvery liquid song. Soon it widens and seems to rest while it forms the pool and the pond. See the cattle standing on its brink or in its cooling depths. Then it is off again gathering new strength—no longer can you step from stone to stone to reach the other side. The old bridge spans its banks—now it darts into the woodland—see how it undermines that tall pine; the sturdy oak succumbs to its power, and lo! they both come crashing down, but on it goes increasing in strength, dashing against stones, boiling and seething, leaping in cascades, tumbling in waterfalls, turn- the old mill-wheel, floating the logs, and now we behold the peaceful river with life on its placid bosom. First we see the little skiff, then the small white sail, and then the larger craft. Villages here and there dot its banks. Soon cities appear, and now its impure waters move sluggishly down to the sea. No longer does it fill the heart with pleasure or the eye with crystal images. Now, alas! its dark sullen waters are made a convenience for commercial traffic and enterprise, and if we go to its banks we hear only its monotonous swish against the pier, or the angry plunge of its larger waves.

Let us look more closely into this hurried description and see if there are any art lessons we can draw from the different scenes through which we have passed. We will find a few pictures here and there which I think are in keeping, and complete in themselves.

Permit me to suggest:

(1). The small stream, of no particular interest without water-fowl or, perhaps, an urchin picking water-cress.

(2). The pond. How many interesting subjects may we get here? Cattle drinking, ducks paddling, the old punt half sunken in the water, children bailing with an old lobster can, the weeds and

rushes mirrored at its margin. There are fifty things that are picturesque about an old pond.

(3). The old bridge. To me there is more poetry in an old stone bridge than in any volume that I have ever read. I will not say it is beautiful or grand or lovely, but it is ever quaint, and it pleases my eye and soothes my heart. If you sit by its old grey side and watch the water gently flowing under its shadowed arch, you cannot help feeling a sense of peace and pleasure. The old bridge needs no embellishment.

(4). Now we hear the lazy monotonous hum of the old mill-wheel, and we can just see the mill's gable through the trees. Let us go a little nearer and see the water coming down the race and striking the heavy lopsided wheel. Its buckets are filled and emptied in dreamy succession as it grinds and creaks and groans its jolly old song. The miller too is just as slow, and, I hope, just as happy. When we leave our busy bustling life in the city and gaze on quiet peaceful scenes like these, how they at once fill us with a feeling of restful repose. Our hearts warm to these rural scenes. At every turn we get a picture that will please.

(5). But let us follow on down the old beaten pathway by the stream. The waters seem to flow more rapidly. What noise is this echoing through the woodland? Nearer we come. We find it is necessary to make a descent, and looking back, behold the waterfall, its bridal veil set in variegated green. The overhanging rocks threaten a too near approach, and as the silvery spray envelopes our being, we stand filled with silent admiration. Surely we need no accessories here.

(6). Now we come to the rapids and the beautiful cascades. Here nature herself makes our picture. Water in motion is always picturesque, but especially so when leaping from rock to rock, dashing its spray into the sunlight. How it glistens in all the colors of the rainbow. There is a peculiar fascination about this part of river scenery that is bewildering, and those of you who have enjoyed the privilege of a trip down the St. Lawrence, will fully realize my meaning.

(7). Here we make the portage and, now, another change. Logs are being rolled into the stream. Sturdy men, with their long spiked poles, float on the round slippery timber. What strength and

agility in every movement. Surely we may find an interesting picture here.

(8). Lastly, the smooth peaceful river. How it seems to take a rest after gathering all its tributaries into its bosom, gently bearing them onward to the sounding sea.

I think you will admit that each of these pictures is complete in itself, and I can assure you that if you try to make more out of them or add to them, you are apt to spoil their harmony.

Simplicity and truth touch the heart more surely than man's ingenuity.

You will see from this hasty description, that it is not my intention to enter into any theoretical discourse whatever. No, gentlemen, I am endeavoring to point out, or merely give, a few hints that I hope may awaken a desire in you to investigate the truth in nature under varied conditions. But thus far we have treated of merely every-day subjects, such as you can see in this locality in all their varied loveliness and beauty.

Now we will take another step and look at what we call effects, for they are pictures in themselves, and appeal to you especially, for some of them are so fleeting that it is almost impossible for artists to catch them at their best. With your camera many beautiful things can be secured. Take for instance reflection. When we contemplate it, does it not seem almost phenomenal? Did you ever walk along the banks of a river, on a very still evening, just after sunset, and look into the magic depths? Soon you lose all sense of surface, and, as you note the perfect reproduction of surrounding objects, you feel enchanted. As the light gradually fades, how unreal and mysterious these borrowed forms become. These make excellent subjects for you, and in the quiet woodland pools some beautiful bits can be obtained.

Moonlight effects are also of a most pleasing nature, especially when seen on the water, or if you stand on the beach and watch the moon's mellow path of light stealing out of the far distance, ever widening its quivering silvery sheen as it approaches until it leaves its liquid light of glory at your feet. Such entrancing scenes as these have a moral, pleasing and soothing tendency, and one always feels that nature is full of beauty that not only satisfies the eye, but also reaches our very souls and seems to link us to a better land.

Morning and evening subjects come under this head. You all, no doubt, have observed the solemn, silent, transitions that at this hour take place. How weird the distance becomes in the twilight hour. How gloomy forms, that but an hour ago looked like figures of gold, now stand like dark sentinels, bidding welcome to the darker night. With the coming dawn and its accompanying shafts of splendor, we rejoice to see the gloom disperse, the shadows melt away, and rosy morn shine forth in all her glistening resplendent beauty.

Some wonderful effects are seen among our morning mists in the summer season. No doubt many of you have passed your vacation in Muskoka. Here we get these misty phantoms in all their illusive revels, as if a filmy gauze were lifted, and revealed the uncertain form of some fairy isle. But soon 'tis lost again. Tall pines seem to stretch their blighted arms from out the misty air. Voices can be heard but their forms seem to be enveloped in another world, but as the sun pours forth its stronger rays the mists are rolled away.

Here let me pause and quote a few lines from Scott's "Lady of the Lake." No poet better describes nature in her manifold changes :

"And now to issue from the glen,
No pathway meets the wanderer's ken,
Unless he climb with footing nice,
A far projecting precipice.
The broom's tough roots his ladder made,
The hazel saplings lent their aid ;
And thus an airy point he won,
Where, gleaming with the setting sun,
One burnished sheet of luring gold
Loch-Katrine lay beneath him rolled
In all her length far winding lay,
With promontory, creek and bay,
And island that empurpled bright
Floated amid the livelier light,
And mountains that like giants stand,
To sentinel enchanted land.
High on the south huge Ben-venue
Down to the lake in masses threw
Crags, knolls and mounds confusedly hurled,
The fragments of an earlier world.
A wildering forest feathered o'er
His ruined sides and summit hoar,
While on the north in middle air,
Ben-au heaved high his forehead bare."

These lines help us to think, and surely convey to us the unerring conclusion that such men must have made a serious study of nature's handiwork. Truly we are engaged in no mean profession. All great men assure us of the refining power imparted by communion with nature. Still we may go further and see greater wonders, perhaps not so applicable to your craft, but grandeur we all should feel and comprehend.

Did you ever notice how an approaching storm prepares our senses to fully realize its mighty power? Stand upon those naked riven rocks that form the mountain-side. Look over the far reaching landscape, spread out in quiet beauty. Away to the west we observe a low-lying mass of clouds, but all around us seems serene. The gentle breeze that we so much enjoyed has ceased; not a leaf stirs; the heat becomes oppressive. We look to the west again; this sombre cloud is rolling towards us; a feeling of dread takes possession of us; but on it comes, the city's domes and spires, that but a moment before glistened in the summer's sun, now seem wrapped in a funeral pall. Out of the sky's inky blackness a long serpentine cloud, grey and sulphurous, rides before. If we look down into the valley now, we see the tall trees bending to the earth. We hear the distant rumbling thunder; now the clouds are rent. The forked lightning flashes in our very eyes. We feel a hot bellowing wind and hear the hissing rain, while deafening peals of thunder almost shake the very mountain. Earth and sky seem to be at war.

This simple description will serve my purpose, for I merely want to show the connection and to impress you with my idea of feeling just what nature is trying to impart to us.

Take most of the photographs of Niagara. Do you think they convey to us any adequate description of its grandeur? We miss the mighty roar, the vibrating earth, the boiling cauldron, the beautiful rainbow, the might, the majesty, the grandeur, the sublimity of the wonderful cataract itself. We must feel before we can express, and although your instrument is sure, I know you are often in doubt, and though nature tempts you on every hand, like myself you are always more or less undecided. Nevertheless, if you take fewer but better-chosen views, I know it will amply repay you.

I have been speaking in a general way, trying to enforce one truth in particular, that is, let your views be in keeping and harmonious.

In concluding this paper I want to say, endeavor to impart to your pictures a clear and pure sentiment. You can do this in photography. No amount of finish and technical skill will hide the faults of an ill-chosen subject.

If you want any particular picture choose the time and place most favorable to that end.

Never introduce figures unless they are in unity with the surroundings.

Avoid views that have too many repeating lines or right angles.

Never choose a subject that is overcrowded with objects; by so doing you defeat all laws of composition.

If you want good pictures—pictures that will please—go to nature unadorned. The impenetrable forest, the unfurrowed hill, and the unconfined stream, give us subjects that everybody will admire.

You have, perhaps, seen Millet's celebrated picture "The Angelus." If not you have seen prints of it. Why has all the art world almost worshipped this wonderful creation? We say it is merely an evening landscape and two figures. Oh! yes; but look into it a few minutes. You see in the distance the old church spire. The evening glow in the sky tells you 'tis the hour for vespers. You hear the sweet notes of the evening chimes come floating over the hill-side, and with the humble peasants you doff your hat and bow your head. Many artists could paint the picture; few artists could portray the reverential feeling and sentiment with which it abounds.

Let me close with the following beautiful lines from Wordsworth:

* * "Nature never did betray
The heart that loved her; 'tis her privilege,
Through all the years of this our life, to lead
From joy to joy; for she can so inform
The mind that is within us, so impress
With quietness and beauty, and so feed
With lofty thought, that neither evil tongues,
Rash judgments, nor the sneers of selfish men,
Shall e'er prevail against us, or disturb
Our cheerful faith, that all which we behold
Is full of blessings."

REPORT OF THE COUNCIL.

Read at the Annual Meeting, May 11th, 1893.

The Council has pleasure in submitting a report for the session of the Association for the season 1892-3.

Seven meetings of the Council have been held, reports of which have been regularly made to the Association.

During the year twelve general meetings of the Association have been held, at which the average attendance has been 51.

Following is a list of the titles and authors of the papers read at these meetings:

1892.

Oct. 13th.—"The Aims and Work of the Association," A. Alexander.
Oct. 27th.—"The Possibilities of Fiction," W. Sanford Evans.
Nov. 24th.—"Zone Life of Ferns," Prof. Wright, Los Angeles, Cal.
Nov. 24th.—"Biological Notes," Wm. Yates, Hatchley, Ont.
Dec. 8th.—"Southern California," Rev. Wm. Ormiston, Azusa, Cal.
Dec. 8th.—"Revised Spelling," James Ferres.
Dec. 22nd.—"Ballads, and Ballad Literature," H. B. Witton.

1893.

Jan. 12th.—"The Flora of the Niagara Peninsula West of Hamilton," Professor John Macoun, Ottawa.
Jan. 26th.—"The Golden Mean in Wealth," S. B. Sinclair, B. A.
Feb. 9th.—Lantern Night, Photographic Section.
Feb. 23rd.—"Studies in Sociology," R. T. Lancefield.
Mar. 9th.—"Insects Injurious to Fruit," L. Woolverton, M. A., Grimsby.
April 13th.—"Fads," Dr. T. W. Reynolds.

It is pleasing to report that the Photographic Section, organized a year ago, has been doing excellent work, and has added in no small degree to the profit and pleasure of the Association.

The membership has been increased by eleven ordinary members, two have withdrawn, and one, our esteemed Treasurer, has been removed by death. Mr. Bull was for many years Treasurer of the Association, and it is hardly necessary to say, took an active interest in all that concerned the welfare of the society. His loss is

deplored by every member of the Association, and in him we have lost one who was identified with the society since its inception.

A number of donations have been added to the Museum during the year, and the question will doubtless arise ere long as to space for display purposes. It is not readily realized at the present time the future value to be placed on the contents of this Museum, and the Council would impress on members of the Association the wisdom of adding, as opportunity presents itself, such articles as are necessary to make the collection as complete as possible, and more especially that portion of it which represents this section of the Province.

Attention is directed to the valuable works on scientific and other subjects, in the possession of the Association, and which are accessible to the members.

All of which is respectfully submitted.

A. ALEXANDER, *President.*

C. R. McCULLOUGH, *Secretary.*

REPORT OF THE GEOLOGICAL SECTION.

Read at the Annual Meeting of the Association, May 11th, 1893.

The Section, in submitting this report, desires first to intimate that the usual interest in the work done during the past year has been maintained.

The Section deemed it necessary, and obtained a small sum of money from the Council of the Association for the purpose of having prepared some sliced and polished sections of our Niagara fossil sponges, so that they would be better appreciated by the general observer, and also enable the expert to more easily determine the species from the revealed skeletal structure. Although the number of prepared specimens is not large, the excellency of the work bestowed upon them gives great satisfaction to the members of the Section. The specific differences are, in many cases, slight, but they can be easily determined by the aid of the polished sections.

Our indefatigable chairman has, from time to time, directed the attention of the members, by his valuable papers, to the subject of identification of some of the fossil plants lately obtained from the rock formation in the vicinity, and respecting which there has been much diversity of opinion expressed by many palæontologists. By these recent discoveries our chairman has been able to produce such convincing evidence as to leave no doubt in the minds of the members of the Section that these hitherto so-called problematical organisms are of undoubted vegetable origin.

A large number of very interesting specimens have been added during the past year to the Geological Department of the Museum of the Hamilton Association.

The Section has held ten meetings during the year, at all of which interesting papers were read by Col. Grant. These papers contain much information of local interest, and are the result of careful investigation. Some of them have reference to economic materials, some refer to the recent discoveries of fossils, and are therefore aids to science, and one offers suggestions as to how we can best make our Museum more attractive to the general public.

Following are the subjects on which papers were read, with their dates:

1892.

May 27th.—"Notes on Our Local Building Stone."

June 22nd.—"Notes, Geological, on the Field Day of the Hamilton Association at Grimsby."

(There were no meetings held during the months of July and August.)

Sept. 30th.—"Notes on our Local Building Stone, Part II."

Oct. 28th.—"Notes, Antiquarian and Geological, No. III."

Nov. 25th.—"Notes on the Aulocopina of Dr. Billings."

Dec. 22nd.—"Notes on Some New Fossil Organisms."

1893.

Jan. 27th.—"Notes on Receptaculites."

Feb. 24th.—"Annelid Burrows, Trails, Fucoids, etc."

Mar. 24th.—"Annelid Burrows, Trails, Fucoids, etc., No. IV."

April 28th.—"The Deficiencies in Our Museum."

All of which is respectfully submitted.

C. C. GRANT, *Chairman.*

A. T. NEILL, *Secretary.*

REPORT OF THE BIOLOGICAL SECTION.

Read at the Annual Meeting of the Association, May 11th, 1893.

During the past year this Section held thirteen meetings.

The meetings were kept up during the summer months, but did not prove a great success.

Although only one regular paper was read before the Section, we always had subjects and objects of interest to discuss at our meetings.

We feel greatly indebted to our worthy friend, Mr. Yates, of Hatchley, for his very interesting and instructive series of Biological Notes, read before the Section at several of our meetings.

We specially draw your attention to the note regarding the amount of wild life still to be found in Ontario.

On February 3rd, Mr. J. B. Turner read a paper on the "Ornithorhynchus Paradoxis, or Duck-Billed Platypus of Australia," a specimen of which we have in our Museum.

On March 10th, Mr. A. Alexander favored us with a sketch of his summer trip up the Tyrolese Alps, with especial reference to the Botany of the district.

At the Association field day at Grimsby Ravine on June 11th, this Section was well represented, and several Botanical specimens were collected.

On July 20th, the Section held a field day at Dundas Ravine, which was well attended by the members.

Some of our members possess powerful microscopes, which have added interest to our meetings from time to time.

In Botany considerable individual work has been done during the summer, and for the coming season a systematic visitation of botanical grounds near here has been arranged.

Several additions have been made to our herbarium, of wild plants found in this locality.

J. B. TURNER, *Chairman.*

H. S. MOORE, *Secretary.*

REPORT OF THE PHILOLOGICAL SECTION.

Read at the Annual Meeting of the Association, May 11th, 1893.

Since its last report to the Association, this Section has held seven meetings, at which papers were read as follows:

1892.

Sept. 16th.—"Graduation in Vowel Sounds," by W. Connor, B. A.

Dec. 22nd.—"Words," by J. H. Long, M. A., LL.B.

1893.

Jan. 20th.—"Philological Notes," by A. W. Stratton, B. A.

Mar. 17th.—"The Origin and Development of our Alphabetical Characters," by W. McD. Logan, B. A.

The October and November meetings were devoted respectively to a discussion of the previous paper, and to drafting the season's work.

It is expected that two interesting papers will yet be read before the season's work is completed.

The amount of work done in the Section this year has not been up to our expectations. This is owing partly to the fact that the work is not of a nature to popularize itself, and not a little to the loss we sustained in the removal from our district of A. W. Stratton, B.A., and Prof. J. F. McLaughlin, B. A., B. D., two of our most enthusiastic workers.

H. P. BONNEY, *Chairman.* W. H. ELLIOTT, *Secretary.*

REPORT OF THE PHILOSOPHICAL SECTION.

Read before the Annual Meeting of the Association, May 11th, 1893.

Since submitting their last report, your Section has held seven meetings, at six of which papers were read as follows:

1892.

May 21st.—"Apperception," by S. B. Sinclair, B. A.

June 18th.—"Some Thoughts on Liberty and Laws," by John Holliday, M. A.

October 22nd.—"Hypnotism," by John King, M. A.

Nov. 19th.—"Socrates and the Socratic Schools," by S. A. Morgan, B. A.

Dec. 17th.—"Aristotle as an Educator," by Mrs. Newcombe.

1893.

Mar. 18th.—"The Science of Economics," by J. T. Barnard.

The meeting of April 15th was devoted to the consideration of certain economical questions arising from the discussion of the previous evening.

While the number of those attending our meetings is not large, we are convinced that good work is being done, and of such a character as could not be attained from general meetings of the Association.

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

REPORT OF THE PHOTOGRAPHIC SECTION.

Read at the Annual Meeting of the Association, May 11th, 1893.

During the past year a great deal has been done towards making this a permanent Section. A number of outings have been held and much good work has been done and valuable experience gained. We regret that these outings were not better attended, and it is hoped that the members will avail themselves of the outings to be held this coming summer. It is only by attending these excursions and all the meetings that the objects of this Section will be attained. During the month of November, Mr. T. H. Wilkinson, water color artist of Toronto, read a very instructive paper on "How to View Pictures in Nature." A large number of the members and their friends attended and were highly pleased with the very able paper. The pictures set forth and the advice given contained many valuable thoughts, and it is confidently expected that better results will follow in this summer's work as a result of the profitable and timely advice contained in Mr. Wilkinson's paper.

During the month of October, Robt. Moodie read a paper and gave two evenings of practical instruction in the art of lantern slide making, as a result of which the Association has lately had practical proof. A lantern slide exchange has been formed between the Toronto and Montreal Camera Clubs and this Section, and it is through the kindness of Mr. Moodie in extending to this Section his knowledge of slide making, that we have been enabled to send outside clubs sets of views.

To Mr. Moodie is due the thanks of the Association for giving this Section the use of his lantern.

All of which is respectfully submitted.

SAMUEL BRIGGS, *Chairman.* WILLIAM WHITE, *Secretary.*

HAMILTON ASSOCIATION.

Statement of Receipts and Disbursements for the Year ending May 11th, 1893.

INCOME.

Cash Balance from 1892,	$255 65
Government Grant,	400 00
Sale of Engravings,	5 00
Members' Subscriptions,	188 00
	$848 65

EXPENDITURE.

Rent,	$148 00
Gas,	17 45
Printing, Stationery, Postage,	391 80
Sundry Expenses and Caretaker,	130 83
Balance,	160 57
	$848 65

C. R. McCULLOUGH,
Sec.-Treas.

I have examined the vouchers and found them correct.

GEO. BLACK,
Auditor.

May 11th, 1893.

THE

JOURNAL AND PROCEEDINGS

OF

THE HAMILTON ASSOCIATION.

IS SENT TO THE FOLLOWING:

I.—AMERICA.

(1) CANADA.

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

(2) UNITED STATES.

Kansas Academy of Science	Topeka, Kan.
Kansas University Quarterly	Lawrence, Kan.

Psyche.....Cambridge, Mass.
American Academy of Arts and Sciences.....Boston, Mass.
Library of Oberlin College.....Oberlin, Ohio.
American Association for Advancement of Science. Salem, Mass.
National Academy of Sciences.....Cambridge, Mass.
Museum of Comparative Zoology..... " "
American Dialect Society..... " "
United States Department of Agriculture.....Washington, D.C.
Biological Society of Washington..... " "
Philosophical Society of Washington..... " "
Smithsonian Institution..... " "
United States Geological Survey..... " "
American Society of Microscopists.....Buffalo, N. Y.
Buffalo Society of Natural Sciences..... " "
California Academy of Sciences.....San Francisco, Cal.
California State Geological Society..... " "
Santa Barbara Society of Natural History..... " "
University of California.....Berkely, Cal.
Minnesota Academy of Natural Sciences .....Minneapolis, Minn.
Academy of Natural Sciences.....Philadelphia, Pa.
Academy of Sciences.....St. Louis, Mo.
Missouri Botanical Gardens..... " "
American Chemical Society.....New York City.
New York Microscopical Society..... " "
The Linnean Society..... " "
American Astronomical Society..... " "
American Geographical Society..... " "
New York Academy of Sciences..... " "
Torrey Botanical Club..... " "
Central Park Menagerie..... " "
Cornell Natural History Society.....Ithaca, N. Y.
Johns Hopkins University.....Baltimore, Md.
Kansas City Scientist.....Kansas City, Mo.
Wisconsin Academy of Science, Art and Letters, Madison, Wis.
Society of Alaskan Natural History and Ethnology, Sitka, Alaska.
Agricultural College.....Lansing, Mich.
Colorado Scientific Society.....Denver, Col.
Museum of Natural History.....Albany, N. Y.
Rochester Academy of Sciences.....Rochester, N. Y.

(3) WEST INDIES.

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

(4) SOUTH AMERICA.

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

II.—EUROPE.

(1) GREAT BRITAIN AND IRELAND.

England.

Bristol Naturalists' Club ..... Bristol.
Literary and Philosophical Society of Leeds .... Leeds.
Conchological Society ..... "
Royal Society ..... London.
Royal Colonial Institute ..... "
Society of Science, Literature and Art ..... "
Geological Society ..... "
Manchester Geological Society ..... Manchester.
Mining Association and Institute of Cornwall.

Scotland.

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

Ireland.

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

(2) AUSTRIA-HUNGARY.

Anthropologische Gesellschaft ..... Vienna.
K. K. Geologische Reichsanstalt ..... "

(3) BELGIUM.

Société Géologique de Belgique ..... Liège.

(4) DENMARK.

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

(5) FRANCE.

Académie Nationale des Sciences, Belles-Lettres et Arts ..... Bordeaux.

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

(6) GERMANY.

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

(7) RUSSIA.

Comité Géologique . . . . . St. Petersburg.

III.—ASIA.

(1) INDIA.

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

(2) STRAITS SETTLEMENT.

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

(3) JAPAN.

Asiatic Society of Japan . . . . . Tokyo.

IV.—AFRICA.

(1) CAPE COLONY.

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

V.—AUSTRALASIA.

(1) AUSTRALIA.

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

(2) NEW ZEALAND.

New Zealand Institute . . . . . Wellington.

(3) TASMANIA.

Royal Society of Tasmania . . . . . Hobartown.

LIST OF MEMBERS

OF THE

HAMILTON ASSOCIATION.

HONORARY.

1881 Grant, Lt.-Col. C. C., Hamilton.
1882 Macoun, John, M. A., Ottawa.
1885 Dawson, Sir Wm., F. R. S., F. G. S., F. R. S. C., Montreal.
1885 Fleming, Sanford, C. E., C. M. G., Ottawa.
1885 Farmer, William, C. E, New York.
1885 Ormiston, Rev. William, D. D., Gladstone, Los Angeles, Cal.
1885 Rae, John, M. D., F. R. G. S., LL. D., London, England.
1886 Small, H. B., Ottawa.
1886 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.

CORRESPONDING.

1871 Seath, John, M. A., Toronto.
1881 Clark, Chas. K., M. D., Kingston.
1881 VanWagner, Lieut.-Col. P. S., Stony Creek.
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 Wilkins, D. F. H., B. A., Bac. App. Sci., Beamsville.
1889 Kennedy, Wm., Austin, Tex.
1891 Hanham, A. W., Quebec.
1892 Woolverton, L., M. A., Grimsby.

LIFE.

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

ORDINARY.

1892 Adam, Alex. E.
1882 Adam, Jas. R.
1881 Aldous, J. E. P., B. A.
1872 Alexander, A., F. S. Sc.
1892 Alexander, Ernest
1891 Arthur, C. C., M. A.
1892 Baker, C. O.
1892 Baker, Alfred H.
1885 Baker, Hugh C.
1880 Ballard, W. H., M. A.
1891 Birkenthal, Rev. H., Ph. D.
1880 Black, Geo.
1890 Bonny, H. P.
1881 Boustead, Wm.
1892 Bowman, J. W.
1881 Bowman, Wm.
1880 Briggs, Samuel.
1857 Brown, Adam
1891 Brown, O. J., M. A.
1885 Buchanan, W. W.
1892 Buckley, Miss M. A.
1892 Burkholder, J. G. Y.
1880 Burns, Rev. A., D. D., LL.D.
1891 Burns, J. M.
1889 Campbell, D. J.
1892 Cameron, Chas. E.
1890 Cape, John
1891 Carpenter, H., B. A.
1891 Chapman, J. R.
1891 Chapman, W.
1880 Charlton, B. E.
1891 Cheyne, John P., Commander R. N.
1884 Childs, W. A., M. A.
1890 Clark, D., D. D. S.
1890 Cloke, J. G.
1887 Colquhoun, E. A.
1891 Crawford, J. T., B. A.
1892 Crisp, Alf. C.
1880 Cummings, James
1892 Cuttriss, Geo. H.
1892 Davidson, Mrs. M.
1892 Davis, Miss M. L.
1872 Dickson, George, M. A.
1880 Dillabough, E. H., M. D.
1892 Devine, A. L.
1892 Dow, R. C.
1891 Eastwood, John M.
1892 Edgar, Robt. L.
1890 Elliott, W. H., Ph. B.
1881 Evans, J. DeV.
1891 Evans, W. Sanford
1881 Fearman, F. W.
1882 Ferres, James
1890 Finch, C. S.
1880 Findlay, W. F.
1880 Fletcher, Rev. D. H., D D.
1880 Forbes, A. F.
1891 Foster, F. G.
1880 Foster, W. C.
1892 Garrett, A. D.
1880 Gaviller, Alex.
1882 Gaviller, E. A., M. D.
1883 Gibson, Hon. J. M., M.A., LL. B.
1888 Grant, A. R.
1892 Grant, W. J.
1887 Greene, Joseph
1883 Grossman, Julius
1888 Galbraith, W. S.
1887 Hancock, Wm.
1882 Harris, W. J.
1892 Heming, A. H. H., O.S.A.
1887 Hobson, Thos.
1890 Holden, Mrs. J. Rose

1892 Holliday, John, M. A.
1891 Hore, J. C.
1887 Ireland, S. J.
1892 King, A., M. A.
1882 Laidlaw, Rev. R. J., D. D.
1890 Lancefield, R. T.
1884 Lee, Lyman, B A.
1892 Lees, George
1890 Lees, Thomas
1857 Leggat, Matthew
1890 Leslie, Geo. M.
1880 Leslie, James, M. D.
1880 Littlehales, Thomas
1891 Lochead, L. T, M. A.
1887 Logie, W. A., B. A., LL. B.
1880 Lyle, Samuel, Rev., B. D.
1891 McClemont, Wm. M.
1891 McCullough, C. R.
1857 McIlwraith, Thos.
1890 McInnes, Hon. Donald
1884 McLaren, Henry Major
1890 McLaughlin, J. F., B. A.
1880 Macdonald, J. D., M. D.
1857 Malloch, A. E., M. D.
1891 Manning, A. E.
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1886 Martin, Edward, Q. C.
1892 Mathesius, R. A.
1892 Mills, Edwin
1887 Mills, Geo. H.
1886 Milne, Alex.
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1892 Moodie, Jas. R.
1887 Moore, A. H., Lieut.-Col.
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1890 Moore, Henry E.
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1891 Morgan, S. A., B. A.
1886 Morgan, W. S.
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1883 Murton, J. W.
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1880 Neill, A. T.
1887 Nelligan, J. B.
Noyes, Mrs. Ed. F.
1892 Overell, M. J.
1885 Plant, John
1892 Pottenger, John
1892 Powis, A.
1891 Rastrick, E. L.
1891 Rastrick, F. J.
1881 Reynolds, T. W., M. D.
1890 Roach, George
1892 Robertson, R. A.
1882 Robinson, W. A.
1892 Ross, Lucien G.
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1892 Sanford, E. Jackson
1890 Schofield, W. H., B. A.
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1891 Sinclair, S. B., M. A.
1885 Smart, Wm. L.
1892 Southam, Richard
1890 Staunton, F. H. Lynch-
1890 Staunton, George Lynch-
1892 Stark, Robert
1890 Stratton, A. W., B. A.
1892 Swanzie, Miss Kate G.
1892 Sweet, David
1892 Sweet, Harry
1892 Smith, J. H.
1892 Sykes, W. J., B. A.
1892 Thompson, R. A., B. A.
1881 Tuckett, Geo. E.
1891 Turnbull, A. C.
1892 Turnbull, J. D.

1892 Turnbull, W. R.
1880 Turnbull, William
1891 Turner, J. B., B. A.
1892 Turner, W. J.
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1881 Vernon, Elias, M. D.
1887 Walker, A. E.
1892 White, Wm.
1888 Williams, C. J.
1881 Williams, J. M.
1892 Wilson, Wm.
1857 Witton, H. B.
1885 Witton, H. B., Jr., B. A.
1891 Witton, J. G., B. A.
1884 Young, Wm.

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JOURNAL AND PROCEEDINGS

OF THE

Hamilton Association

FOR SESSION OF 1893-94.

NUMBER X.

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1891—Col. Grant ; W. A. Robinson ; J. F. McLaughlin, B. A. ; T. W. Reynolds, M. D. Wm. Turnbull.

1892—T. W. Reynolds, M. D. ; W. A. Robinson ; P. L. Scriven ; Wm. Turnbull ; Wm. White.

1893—James Ferres ; A. E. Walker ; P. L. Scriven ; William White ; W. H. Elliott, Ph. B.

ABSTRACT OF MINUTES

OF THE PROCEEDINGS OF THE

Hamilton Association

DURING THE

SESSION OF 1893-94.

THURSDAY, NOVEMBER 9th, 1893.

OPENING MEETING.

The President, Mr. A. Alexander in the chair.

On account of the popular nature of the evening's programme the regular order of business was dispensed with.

The meeting opened with the President's address, outlining the recent discoveries in the scientific world. Mr. Alexander closed his address with a strong plea for a more hopeful confidence on the part of scientists in the perfection of the cosmic economy. At the conclusion of the President's address the meeting was given over to a display of the characteristic work of the various sections. This included biological, geological, botanical and photographic specimens. Through the kindness of Mr. J. E. P. Aldous, B. A, a musical programme was presented during the evening

Over two hundred members of the Association and their friends availed themselves of this opportunity of viewing the work of the various sections.

THURSDAY, DECEMBER 21st, 1893.

The President in the chair.

The Curator reported the donation to the museum of a number of valuable specimens. One application for membership was received.

After the transaction of business, Mr. H. B. Witton, Sr., read his paper, entitled "Early Printing, Printers and Books." After giving an account of the different men for whom had been claimed the honor of inventing the printer's art, the essayist gave a full outline of the remarkable work accomplished by our own countryman, Caxton.

Coming down to more recent times, the paper called attention to the enormous growth of literature, and the consequent advance given to religion, science and sociology. The paper was supplemented by numerous fac-similes of the work of these early artists.

A brief discussion followed.

THURSDAY, JANUARY 11th, 1894.

Mr. A. T. Neill, Vice-President, in the chair.

Mr. F. Hansel, D. D. S., was elected an ordinary member of the Association. One application for membership was received.

The Vice-President then called on Mr. W. Lash Miller, B.A., Ph. B., of Toronto University, to read a paper entitled, "The Kinetic Theory." Beginning from the time of the discovery of what is known as "Boyle's Law," the lecturer traced through its various phases the development of the modern theory concerning the composition of matter, and further illustrated the mathematical calculations by which scientists have worked out many interesting results as to the size, weight and number of the individual molecules. A discussion followed.

THURSDAY, FEBRUARY 8th, 1894.

President Alexander in the chair.

Mr. Wm. Mitchell was elected an ordinary member of the Association.

Mr. McCullough then read a short paper contributed by Mr. Yates, of Hatchley, in which were given many interesting facts concerning the amount of game at present obtained in that locality.

The Chairman next introduced Prof. Maurice Hutton, of Toronto University, to read his paper entitled, "The Antigone of Sophocles." After giving a brief outline of the dramatic plot, the paper next pointed out how this illustrated the poet's conception of the mystery of life. From these data two lessons were learned:

First—The value of moderation and humility in working out the problem of human existence; Second—That no character or creation, however excellent, is without its inherent defect which will eventually lead to decay.

A brief discussion followed.

It was announced that the Photograph Section would furnish the programme for the regular meeting in March.

THURSDAY, MARCH 8th, 1894.

President Alexander in the chair.

Four applications for membership were received.

After the transaction of ordinary business the meeting was given over to the members of the Photographic Section, who gave an exhibit of lime-light views of local and foreign scenery, mostly work of members of the section.

The display concluded with a number of Southern views, the work of Mr. B. E. Charlton.

THURSDAY, APRIL 12th, 1894.

Vice-President T. W. Reynolds, M. D., in the chair.

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

The Curator announced a number of donations to the library and museum.

Miss Louise McConnell, Miss Blanche Burns, Mr. Robert Campbell and Mr. Geo. Crawford, were elected ordinary members of the Association.

Mr. J. E. P. Aldous, B. A, then read a paper, illustrated with suitable experiments on "The Theory of Sound," with special reference to its application in music.

An interesting discussion followed on the various points set forth in the paper.

THURSDAY, MAY 10th, 1894.

The President, Mr. Alexander, in the chair.

The Corresponding Secretary announced the receipt of the usual exchanges and Government reports.

The Curator announced a number of donations to the museum.

The Recording Secretary then read a short paper, contributed by Mr. Wm. Yates, of Hatchley, containing notes on Biological subjects.

A short discussion followed.

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

Report of the Council, by the Secretary.
" " " Treasurer, by Thos. Morris, Jr.
" " " Curator, by Alex. Gaviller.
" " " Geological Section, by A. T. Neill.
" " " Biological Section, by H. S. Moore.
" " " Philological Section, by W. H. Elliott, Ph. B.
" " " Photographic Section, by Wm. White.

The following officers were elected for the ensuing year:

President, - - - -	S. Briggs.
First Vice-President, - - -	A. T. Neill.
Second Vice-President, - -	T. W. Reynolds, M. D.
Corresponding Secretary, - -	W. McG. Logan, B. A.
Recording Secretary, - -	S. A. Morgan, B. A.
Treasurer, - - - - - -	Thos. Morris, Jr.
Curator, - - - - - -	Alex. Gaviller.
Asst. Secretary and Curator, - -	Walter Chapman.
Auditor, - - - - - -	H. P. Bonney.

Council: James Ferres, A. E. Walker, Rev. J. Long, M. A., L.L. D., P. L. Scriven, W. H Elliott, Ph. B.

A vote of thanks was tendered the retiring President, after which the meeting adjourned.

REPORT OF THE COUNCIL.

The Council takes pleasure in submitting the following report for the session of 1893-4.

Since its last report your Council has held nine meetings, of which due record has been kept in the minute book of the Council, open to the inspection of the members of the Association.

Six general meetings of the Association have been held during the present session, at which the following subjects were discussed:

1893.

Nov. 9th.—"Recent Discoveries in the Scientific World," A. Alexander.

Dec. 21st.—"Early Printers' Printing and Books," H. B. Witton, Sr.

1894.

Jan. 11th.—"The Kinetic Theory," W. Lash Miller, B. A. Ph. B., (Toronto University.)

Feb. 7th.—"Biological Notes," Wm. Yates, Hatchley, Ont.

Feb. 7th.—"The Antigone of Sophocles," Prof. Hutton, (Toronto University)

March 8th.—Lantern Slides, Photographic Section.

April 11th.—"Sound," J. E. P. Aldous, B. A.

Six ordinary members have been added to the Association and three have withdrawn.

The Museum has received a number of valuable donations during the year, and the demand for additional accommodation is constantly forcing itself upon the members of your Council. As yet, however, we are unable to suggest any definite solution to the difficulty.

The Council would again call the attention of the members to the fact that the Museum is open every Saturday afternoon, and that the contents of the Library and Museum are at all times accessible to the members of the Association.

Although in point of number of meetings and papers read this year may not equal the record of some previous ones, we feel cer-

tain that the quality of the work done has in no way deteriorated from that of former years.

In conclusion, we would place on record or sense of the deep loss sustained by the Association in the removal from the city of Mr. S. B. Sinclair, B. A. As a member of your Council and general Association, and as Chairman of the Philosophical Section, Mr. Sinclair proved himself a valuable aid to the work, and his loss is deeply felt by the members of the Council and the Association.

All of which is respectfully submitted.

A. ALEXANDER, F. R. S.
President.

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

EARLY PRINTING, PRINTERS AND BOOKS.

Read before the Hamilton Association, December 21st, 1893.

BY H. B. WITTON, SR.

Who invented the art of printing with movable cast metallic types, and the kindred enquiry where that art was first carried into actual use, have long been and still are, attractive subjects of investigation. Few questions have been debated more zealously, for so long a time, or by more disputants. For nearly four hundred years, quest of the truth as to where, when, and by whom this great art of the fifteenth century was introduced; and what beyond cavil are the particulars of its parentage and infancy, has been persistently made: and in all parts of the civilized world searchers have joined in pursuit of evidence. Of books written on this subject, the titles alone fill a volume. The works themselves constitute a library. At various times, chief honors have been claimed for different cities where early printing was done, and on behalf of several of the early printers. Recent controversy on this subject has scarcely gone beyond the claims of Coster and Haarlem on one side, and those of Gutenberg, with his associates Fust and Schoeffer, and Mainz on the other. Former competitors have been withdrawn from the contest, and discussion is narrowed to the merits of these claimants. The dispute is also further condensed, as both sides now ignore, as rubbish worthless to serve the cause of honest criticism, documents of questionable authenticity that formerly obtained credence.

Von der Linde, Madden, Blades, Hessels and DeVinne are but a few of the authors who, of late years, have written on the subject of early printing. These writers are specialists of acknowledged merit, whose opinions are the outcome of diversified technical knowledge of typography, and of prolonged study of original fifteenth century documents upon which the principal evidence concerning the invention of printing rests. On this subject all these authors have written at considerable length. As each has pursued his studies in his own way, their books are marked by strong national

and individual characteristics; and their conclusions differ as much as do their methods of investigation. Von der Linde unhesitatingly pronounces for Gutenberg, and ridicules all claims for Coster as legendary and fictitious. Hessels, in 1871, translated Von der Linde's book, "The Haarlem Legend of the Invention of Printing." At that time translator and author were in agreement, but after studying for three years, the chief original documents bearing on the subject, Hessels' views changed, and he has since become Von der Linde's strong antagonist. Mr. Hessels' faith in the validity of Coster's claim strengthened as his belief in Gutenberg waned. In 1882 he wrote the book entitled "Gutenberg; Was He the Inventor of Printing?" and in 1887 he issued a smaller work with the pronounced title "Haarlem, the Birthplace of Printing, not Mainz." In his exhaustive article on early typography, written for Vol. XXIII of the Encyclopædia Britannica, Mr. Hessels concludes as the case stands, "there is no choice but to credit Coster with the invention of printing with movable types at Haarlem about the year 1445." Blades, Madden and DeVinne have contributed original information to the controversy, but their books echo more or less distinctly the stronger utterences of either Von der Linde or Hessels. In the works by these two authors, the leading facts relating to early printing are forcibly stated: new light is thrown into some of the dark corners; and if from either standpoint a finished picture is not at present a possibility; nevertheless good sketches in firm outline are presented by both.

In his essay on Jean Paul Richter, Carlyle says: "Actual facts are nowise so simply related to each other as parent and offspring are; every single event is the offspring not of one but of all other events prior or contemporaneous." Fortunately the truth, somewhat oracularly asserted by Carlyle, is powerless to disturb men's minds. Brevity of life and limitation of human faculties make it impossible to trace even the greatest events through more than a few steps of their entangled unrestricted relationship. To that rule the invention of printing is no exception. Its kindred arts are dimly seen through the mists of the past, and immediate details of its origin are imperfectly recorded. Block books, pictures of saints, and ornaments stamped on textile fabrics and church vestments, if not the direct progenitors of printing, are near relations, were close

forerunners of that art, and give the best clue by which its history can be traced. They are legitimate next of kin to the art of printing books; seals. and brands for identification of cattle, slaves and felons, are but poor and distant relations. These are the oldest and only kindred to printing Europe can boast. The far east has cognate arts of great antiquity and interest.

Among the saint pictures—*Helgen* or *Heiligen*—which helped to pave the way for printed books, the engraving of St. Christopher, found in 1769, by Heinecken, inside the cover of a manuscript at the Chartreuse Convent of Buxheim, in Suabia, stands first. It is a print from a knife engraving, cut in wood used plank-wise; and after the outline drawing was printed, it was colored by hand or stencil. It is one of the treasures of Earl Spencer's collection, lately bought at a cost of nearly a quarter of a million pounds sterling for the whole library by the widow of Mr. John Rylands for presentation to the City of Manchester. Mr. W. J. Linton gives a facsimile of this print, as a frontispiece to his great work "The Masters of Wood Engraving" It is the earliest dated wood engraving known. Under the picture is engraved the date, 1423, and a Latin couplet, near the date, gives the beholder assurance:

Christoferi faciem die quacunqe tueris
Illa nempedie morte mala non morieris.
"That day thou Christopher's face shall see,
No evil death shall happen thee."

Apart from its historical worth, this print has a charm from the naive manner in which the devout old artist tells the legend of St. Christopher. More than twice the stature of common men, he was bound to serve the most powerful ruler on earth. On the advice of a holy man, he undertook to carry pilgrims across a certain stream. One day a child came to be carried over. The gigantic ferryman was surprised that the weight of the little one should be so heavy a burden; and on looking up to learn the reason, he is told that the child borne on his shoulders is the Lord of All, and receives His blessing. The rude picture is full of life. The great strength of the saint is seen at a glance from the palm tree he used as a staff. His immense stature is evident by comparing him with the hermit at his shrine, of whom even the timid rabbit is not afraid; or with

the miller, taking grain on his ass's back to the mill with the quaint old water-wheel ; or with the burly peasant, carrying on his own back from the mill a sack of meal to his distant cottage. The benignity of the infant Saviour who carries the world in his hand, and the fear, humility and astonishment on the upturned face of St. Christopher, are admirably expressed.

Block-books, Xylographs as they are called, were the immediate heralds of printing with types. For the most part they were printed with a brownish-grey ink, in which there was little or no oil ; and in a similar way to the saint pictures. Some of the block-books had no text ; others had no pictures ; but most of the copies known have both text and pictures. Some of them are tinted with colour, after the manner of the St. Christopher, others are uncoloured. The Spencer Library contains fourteen block-books ; and Mr. Hessels says twenty of German and ten of Netherlandish origin are known. One of the largest block-books, that of the *Apocalypsis*, or revelations to St. John, has fifty leaves printed on one side only. The *Biblia Pauperum*, the best-known of these books, has forty leaves, on which are one hundred and twenty pictures illustrating as many dramatic scenes from Bible history. Verses of scripture and skeleton sermons make up a printed text on each page. Although called the Bible of the poor, it is said, the book was designed to aid the less learned of the clergy, and was really the *Biblia pauperum predicatorum.*

In museums and great libraries, a few playing cards, pictures of saints, and block-books have been preserved from times prior to the middle of the fifteenth century. Competent authorities report that these are imprints from pictures and writing engraved on blocks cut plank-wise or parallel with the grain of the wood ; and were taken on paper pressed with a roller, or by friction, to receive the print, just as an engraver takes trial proofs of his work to-day. They were no doubt the work of monks or of professional scribes ; for so far as classical writings were preserved at all, they were preserved by monastics ; and monks also furnished manuscript books of amusement, instruction, and devotion, to the few who could profit by their use. Whether we have had left to us full record of the tentative stages through which the art of printing passed during the first half of the fifteenth century is more than doubtful. As D'Israeli, the

elder, in almost the exact words of Daunou, suggests, we may be too far from the invention of printing ever to know the details of its discovery, and too near to predict with certainty what will be its future results.

The early printed book of most general interest is the *Bible Mazarine.* Singularly enough that Bible had been forgotten until De Bure, little more than a hundred years ago, found a copy among the books formerly owned by the Cardinal Mazarin. Fifty years after De Bure's discovery twenty copies were known, and at present thirty copies are known to exist. Mr. Quaritch, the London bookseller, says that ten copies of the Mazarine Bible have been sold in England since the year 1847, and that at different times five of these were in his own possession. For Sir John Thorold's copy, sold in 1884, Mr. Quaritch paid £3,900. There are two copies in the Library of the British Museum—one printed on paper, the other on vellum; for although paper was known to civilized Europe at least two hundred years before the invention of printing, it was not made in large quantities, and vellum was preferred by scribes and illuminators for their rarer and costlier purposes. It is estimated that three hundred sheep skins were used for a single copy of the Mazarine Bible. In the British Museum copy, the titles to each book, chapter, and psalm, and all the large initial letters, were rubricated by hand. That was often done in incunabala—as books dating from the infancy of printing are called—and as illustrators of books in those days were not all scholars, a director or small letter was often printed to show what initial should be painted in the space left. A Mazarine Bible in the Bibliotheque Nationale at Paris, contains a note stating that Henricus Cremer, Vicar of St. Stephen's at Mainz, finished illuminating and binding that book on August 24th, 1456; a memorandum which incidentally helps to fix the date when the Bible was printed. The British Museum Official Catalogue describes the Mazarine Bible carefully in these words: "It contains six hundred and forty-one leaves "printed in double columns, with forty-two lines to the column. It "is probably the first large book, if not the first piece of printing of "any size, executed by movable metal types. Between 1450 and "1452, Gutenburg is believed to have made experiments which "resulted in the invention of printing with movable metal types

"The printing of this book probably commenced in or about 1452, "on the completion of Gutenberg's invention. Whether we are "justified in treating it as printed throughout by Gutenberg himself, "or should regard it as printed wholly or in part by Fust, who had "lent money to Gutenberg for the purpose of his invention, or by "Schoeffer who printed a *Donatus* with the same types, is a question "not yet fully answered, nor perhaps likely to be answered. There "are documents of the fifteenth century in which the invention is "ascribed variously to one or other of these three."

Next in importance among early printed books is a Bible containing two hundred and forty-one leaves more and six lines to the column less than the Mazarine Bible; and the first Mainz Psalter. The thirty-six line Bible, sometimes called the Pfister Bible, is scarcely less famous than the Mazarine Bible; and the Mainz Psalter, printed by Fust and Schoeffer in 1457, is the first book printed with a date. Of the Pfister, or thirty-six line Bible, not more than ten copies are known. Twenty-one copies of the Mainz Psalter are known. Nine are dated 1457 and twelve are dated 1459. Only a few are perfect; Brunet says the most beautiful copy is in the Imperial Library at Vienna. These psalters were sumptuously printed. Initial ornamental letters of many early-printed books were painted by hand. Those of the Mainz Psalters were printed; and for beauty of design, delicacy of colour, and careful printing they are said by artists and printers hardly to be surpassed in our times. Until lately they were thought to be wood engravings; but Mr. Linton combats that opinion, and says the ornamentation of the initial letter of the first psalm, the letter B covering a space more than three inches square, has a purity and delicacy of outline convincing to him that it was engraved on metal, and not on wood; and that it is beyond the wood engravers art of that day. The Mainz printers, besides their large books, also printed some smaller papers in the first years of their art. The list of their minor works accepted as unquestionably genuine hardly exceeds some Papal indulgences, a *Mahnung* against the Turks, a calendar, and copies from five or six editions of the favorite Latin primer of the day, called *Donatus*, after its author, a Latin rhetorician of the fourth century.

The half-dozen books and few documents left from the first

decade of the art of printing were produced from at least four different kinds of types. Experts differ in opinion as to how these types were made, as much as they do in regard to who made them. Some believe with Fournier—a typefounder and engraver—that the Mainz Psalter was printed with wood letters; others equally competent to judge agree with DeVinne that "no book was ever printed "in Europe with small types of wood." And there seems to be a balance of probability that these types were of metal, cast from pattern letters of wood in sand or clay, after the manner of working jewelry and trinkets at that time, and, that after being so cast, they were trimmed and finished by hand. In the Mainz Psalter different impressions of the same letter of the alphabet exhibit variations of form, readily detected by the practised eye. Such variety of form in the same letter may be inadequate proof the types used were wood or metal; but it does show that the making of types with a steel punch, and copper matrix to serve as a mould for type metal fusible at a lower temperature, was a step further on in the progress of ihe art.

Inscriptions—colophons—formerly placed at the end of books, used to give readers the information now printed on title-pages at their beginning. Of the books printed at Mainz, in the first decade of the art of printing, some have colophons informing the reader where they were produced and by whom; and that they were printed, and not written with reed, stylus, or pen. Of the inventor of the art of making books by such new method, nothing, however is said; on that point the oracles are dumb. The invention was hedged around and the art carried on with a view to secrecy; of that there is little ground for doubt. Publicity would have imperiled control of the new art, and might have reduced the monetary value of books produced in so innovating a manner. Early printed books were facsimiles of carly manuscripts in every day use, and could hardly be distinguished from them. Mr. Blades relates that a few years since an English book-seller of experience and reputation unwittingly sold for half a crown, as an old manuscript, a book printed by Caxton, worth its weight in gold. Popular belief that Fust sold in Paris some of his early-printed Bibles as manuscrips, may not have been altogether without foundation. Be that as it may, name of producer, place, and details of origin were

omitted from the first printed Bibles; and none of the earliest printed books gives any indication as to who invented the new art of printing.

It is disappointing that the first promoters of the art of printing books said so little concerning the novel inventions that brought their calling into existence. Some of the old printers were devoted to their craft; many of them were fond of learning; and their calling was to them an estimable means of livelihood. They were an inner circle, and knew more of the early stages through which the art of printing passed, and by whom its essential processes were invented than the outer world did. But the lips of the earliest craftsmen were sealed; and if those of the second generation told the history of their art, they told it so badly, and each so eagerly pointed out his own favorite as the true inventor, that their assertions are less satisfactory than the reticence of their predecessors. On this subject even John Schoeffer equivocates. The books produced from his press during the twenty years he was a printer are double-tongued witnesses telling two versions of this story. John Schoeffer succeeded to the printing business of Fust and Schoeffer at Mainz. He was son of Peter Schoeffer, Fust's partner, and his mother was Fust's daughter. According to report she was given in marriage to Peter Schoeffer by Fust to consolidate the interests of the Mainz printing firm, and as an appreciative token from Fust of Schoeffer's services. Related as he was by ties of marriage and blood to Fust and Schoeffer. and as their immediate successor in business, John Schoeffer was likeliest of all men to know the respective inventive services of his predecessors to their common art, and of all men was in duty bound to see that his books said nothing about the invention of printing at variance with the exact truth. In 1505, soon after his father's death, in the dedication of his German edition of Livy to Maximilian, he says printing was invented at Mainz, "firstly by the ingenious Johann Gutenberg in 1450, and thereafter improved and made permanent by the diligence, cost and labors of John Fust and Peter Schoeffer"; yet, in some of his other books, he says the author and inventor of the art of printing was his grandfather, John Fust. The words used are: "John Schoeffer, cujus Avus primus Artis impressoriæ fuit inventor et auctor."

Official records of the time throw but a glimmer of light on the early history of printing. There is, however, record of the fact that Fust lent money to Gutenberg in 1449, and made a second advance three years after that date; that as surety for his loan he held claims on certain effects; that in November, 1455, he sought to recover with interest the monies advanced, and that the case was adjudged in his favor. The record of the suit refers to vellum, paper, ink, tools, the book, and workmen's wages. The chroniclers who wrote accounts of the doings of that day, content themselves with narrating concerning printing what was verbally told them by some of the German printers, who, after the siege of Mainz in 1462, carried their art throughout Europe. One of these most interesting paragraphs of hearsay evidence comes from William Fichet. He was not only a good scholar who had been elected rector of the University of Paris, but was an astute man of the world, whom Louis the XI employed in important negotiations, and who received credit for concluding peace with the Duke of Burgundy. He was an earnest patron of the new art of printing, and through his influence Gering, Krantz and Friburger, three German printers, established an office in Paris within the walls of the Sorbonne. In one of the early books from their press put in operation in 1470, there is printed a communication from Fichet, who says the friends of literature will be benefited by these new sort of printers, who, like warriors from the Trojan horse, are scattered abroad. And he adds; "In France the story is that a certain John Gutenberg, not far from Mainz, was the first inventor of the printing art by means of which books are made, not with a reed as of old, nor with a pen as in our days, but with metal letters, and that rapidly, evenly and elegantly."

The Cologne *Chronicle* contains a similar but more specific account. In a narrative comprising eighty lines of his book, the chronicler states that John Gutenberg, who was born at Strasburg, was the inventor of printing, at Mainz, in 1440; that after ten years experimenting and preliminary work, he commenced, at Mainz, in 1450, to print a Bible in Missal types; that while the art of printing in common use was invented at Mainz, a first prefigurement of that art was invented in Holland, in the Donatuses, formerly printed there; and though many wrongheaded men may say books were

printed in former times, what they say is untrue, and that no books printed in former times can be found in any country. The Cologne *Chronicle* bears the name of John Koelhof, Burger of Cologne; but the writer is unknown. It was written in 1499, and the writer enhances the interest of his account by stating that Ulrich Zell, who brought the art of printing to Cologne, and was at that time still a printer there, told him by word of mouth the beginning and progress of that art. Koelhof was himself a printer of note, and is credited with being first of the printers to introduce on each finished sheet the use of printed in lieu of written signatures as a guide for bookbinders. He commenced to print in Cologne in 1472, and as Zell arrived there from Mainz about ten years before that date, it is probable that Koelhof learned the art of printing from Zell himself. Other evidence of great volume, but much of it less tangible and direct, is adduced to sustain the contention; that the art of typography was first invented by Gutenberg, and was first practised at Mainz; that capital for carrying out Gutenberg's plans was furnished by Fust; that, tired at Gutenberg's delay, Fust took suit against him for the money loaned and gained judgment; and that the art was further completed and perfected by Schoeffer, who became Fust's partner.

This paper is not controversial; neither can it add aught by way of fact or argument to a dispute around which cluster the accumulated truths and prejudices of centuries. Its aim is but to cast a passing glance at the present phase of a controversy concerning the origin of an art, which, judged by its utility and results, is perhaps greatest of the arts found out by man. A controversy that has interested each succeeding generation from the sixteenth century till now; which retains its interest undiminished for more readers to day than ever before, and which bids fair to carry over a considerable remainder of unsettled particulars as an heirloom to the next generation; deserves attention, and is worth the trouble of looking at through the murky atmosphere surrounding both sides of the dispute. Uncertainty concerning the origin of printing is explained by the doubt surrounding discoveries made in this century. In inventions of chemistry, metallurgy, optics, and in those of the mechanical and industrial arts, the names of contesting inventors of our day are legion. Besides in medieval times, inventive genius in following up

certain branches of research, had cautiously to grope its way well nigh in the gloom and seclusion of necromancy; but in the nineteenth century scientific societies, patent offices, public companies and the ubiquitous journalist, instantaneously photograph the daily work of the world, and its workers in every branch of science, art and industry.

On the Haarlem side of the question no books of Dutch printing, bearing name and date, between 1450 and 1460, can be produced. Some of the Dutch towns have preserved books printed at their presses in 1472-74; but the oldest dated book printed at Haarlem, is said to be one printed by John Andrea in 1483. There are books and fragments of printed books, said to be of earlier production than these, and which are pointed to in proof that Haarlem is the true birth place of printing; but, like some of the early productions of the Mainz press, they bear no name, place, nor date.

Numerous narratives of events, and statements of a minor kind, were collected by Meerman, and have been quoted by later writers in aid of the claim of Coster. Among these is the genealogy of the Costers, in the Town Hall at Haarlem; a history of printing, said to have been written by Van Zorn and lost in the Haarlem siege; and a statement from an Italian who had lived some years in Holland, that Gutenberg stole the art from Coster. But the most explicit and circumstantial claim for Coster and Haarlem was made in a work called, after the ancient name of Holland, Batavia, which was written by the Dutch savant Young, or Junius, as he was named, after the Latinizing fashion of the times. The Batavia was a posthumous work, published in 1588, thirteen years after the death of Junius and one hundred and thirty years after the production at Mainz of the psalter of 1457. The notable part of the statement by Junius is: That one hundred and twenty-five years before he wrote, Coster printed on paper for his grandchildren some letters cut from the bark of a beech tree; that, contemplating greater things, with his son-in-law's aid, he made an ink more glutinous than common ink, and printed with it the *Speculum nostrae Salvationis.* He then changed his types of wood for leaden types, and these were afterwards changed for types of tin; and, his business prospering, John, one of his servants—supposed to be Fust

—became his partner. This servant, after being taught, under oath, the secrets of the printing art, one Christmas Eve, when the Coster family were all at church, stole the whole of his master's printing apparatus, fled to Amsterdam, thence to Cologne, and finally established a printing office at Mainz, where he printed with his stolen types a grammar called *Doctrinale Alexandri Galli*, and the tracts of Hispanus. Junius adds that he writes what aged people worthy of credence told him; and that Galius, his tutor, and Taresius, who, it seems, was some time secretary to Erasmus, also informed him that one Cornelis, a bookbinder of Haarlem, eighty years old, also told them the same story. Few statements are on record for which such an array of names could be cited in censure or in commendation; and its appraisal runs the complete scale from historical fact to idle fiction. The records of Haarlem show the name of Cornelis, a bookbinder of that date, and two different families have had thrust on them the honor of Coster's lineage. The first Laurence, an innkeeper, it was found, died in 1439. His claim has been given up; but since 1870 the career of another Coster, of Haarlem, has been found to fit in part into the account by Junius, though Mr. Hessels admits some parts of that account are yet to be explained.

Chief interest in the Junius statement centres in the book Coster is said to have printed; and in the two books Junius says Coster's servant printed with the stolen types. The *Speculum Humanae Salvationis*, credited to the Coster press, as its name implies, is a mirror shewing the Fall and Redemption of man. There are four early-printed editions of this book, two in Latin and two in Dutch. There is but little difference in these four editions; each contains a short introduction and fifty-eight leaves of wood cuts and text, printed only on one side of each leaf. Each engraving forms two pictures, comprising in all more than four hundred figures. The picture takes up the upper half of each leaf, and the text is printed in two columns beneath it. In one edition, twenty-four pages of both text and pictures are engraved; otherwise the engravings are on wood, and the printing is from movable metallic types. All the engravings are printed with brown ink, but in three of the four editions the text was separately printed in black ink. In all four editions the types are the same. Of the books said to have been printed with the stolen types, as yet no copy of the Hispanus Tracts

has been claimed by the Costerians; but from the same types four editions of the *Doctrinale* mentioned, and six editions of the small Donatus grammar have been found. With subtle but somewhat strained reasoning, Mr. Hessels endeavors to show that altogether forty-seven Dutch printed books, or fragments of books, have been brought to light that were printed with the same types used for printing the *Speculum*, or with types so near akin as to be inseparable from them, and of these there are twenty-one editions of the Donatus grammar. It is further argued, these books are more archaic than the early Mainz books; and are a necessary link between the rudely-cut letters of the block books and the superb printing of Fust and Schoeffer. Moreover, these Donatus grammars printed with movable types like those used in the *Speculum*, are, it is urged, the veritable books spoken of in the Cologne *Chronicle* by Zell, in which prefigurement of the art of printing was first invented in Holland.

This point of the discussion necessarily hinges on the question whether the forty-seven books and fragments of books printed with type and in a manner more archaic than German type and printing, are older than the Mainz *Indulgence*, of 1454, and should, therefore, be historically placed before it. Waiving for the time positive affirmations pro and con, the answer of Wm. Blades—a friendly witness for Haarlem—made shortly before his death in 1890, is worth quoting. He says: "Honestly speaking, I think the direct "proofs insufficient; but if we study the typographical evidence by "the light of the Cologne *Chronicle*, the probabilities seem to me "quite on the side of the *Costeriana*. * * The evidence on "each side may be enlarged in the course of years, but so far as it "goes at present it is strongly in favor of the first rude invention of "moveable types in Holland by some one whose name may have "been Coster. The claim of Gutenberg upon the respect of posterity "rests on his great improvements—so great as to entitle him in a "sense to be deemed the inventor—foremost in excellence if not "first in time."

On behalf of Mainz it is contended that the Dutch school grammars which were the prefigurement—*vurbylding*—of the Mainz invention, were Xylographic or Block-book Donatuses; and to construe the reference in the *Chronicle* to them, to mean they were printed

by movable types, is to stultify and make meaningless the whole account given by Zell of the invention of printing. It is further urged, the art of printing with movable types could not have been practised in Holland without eliciting comment from artists and cultivated men of that time. Among other notables, Caxton and Erasmus both lived in the Low Countries during a good part of the latter half of the fifteenth century; and both credit Mainz with being the birth-place of printing. Yet Erasmus was a Hollander by birth; Caxton lived in Bruges a quarter of a century, and both were on such terms of personal intimacy with the printers of the time and were such admirers of the printing arts, that the invention, in Holland, of movable types could hardly have escaped their knowledge. It is admitted that no Block-book Donatus is known; perhaps school books of that day were more perishable than they generally have been, and now are. More diligent search than ever before will be made, and fifteenth century bindings and all likely lurking places will be ransacked for them, the types of the forty-seven Costeriana will also be subjected to systematic examination by experts, and by these and kindred means the enlarged evidence, considered by Mr. Blades necessary before passing final judgment, may yet be found.

By the year 1500 printing presses were at work throughout Europe in two hundred cities and towns. Jenson, Aldus Manutius, Koburger, Colard Mansion and Caxton are but a few of the more enthusiastic men whose names are on the bead roll of fifteenth century printers. Koburger, at Nuremburg, kept at work twenty-four presses and a hundred men. He printed twelve editions of the Latin Bible; and an illustrated German Bible said to be his masterpiece. Aldus Manutius followed close on the heels of Jenson at Venice, and made it a work of his life to spread a knowledge of the Greek classics. So well did he succeed in his task, that he sold a pocket edition of Greek authors at a price equivalent to fifty cents a volume; whereas, only thirty years before, the King of France, Louis XI., according to old bibliographers, had to pledge plate in security for a borrowed volume, and an Italian nobleman sold an estate to buy a Latin copy of Livy. What the Aldine printers did for Greek, the Elzevirs, at a later day, did for Latin literature. In Holland, chiefly at Leyden and Amsterdam,

fourteen members of the distinguished Elzevir family were printers and booksellers; and during one hundred and thirty consecutive years their presses sent forth twelve hundred editions, nine hundred and sixty-eight of which were Latin classics or modern authors who wrote in Latin.

But none of the old printers stands in such intimate relationship to English literature as William Caxton; and to English readers his name and books have charms exclusively their own. Caxton learned the printing art on the Continent, probably at Cologne, soon after the year 1471. Although direct testimony is lacking, it is probable that Veldner, Colard Mansion and Caxton worked together at Cologne in the same office, but under what master-printer is conjectural. Biographies of Caxton have, within a few years past, been written by Charles Knight and by Mr. Blades. To both the work was a labour of love, and both were printers who wrote with the enthusiasm of craftsmen for their art. Charles Knight was a pioneer in opening up the treasures of good literature to the masses, and was so advanced a printer, publisher and author as to be called the Caxton of the nineteenth century. His Cyclopædia, issued in penny numbers half a century ago—one of his many enterprises to popularize knowledge—cost for literary labour alone £40,000. Mr. Blades, in his life of England's first printer, has traced out and studied the productions of Caxton's press with a pious care unsurpassed by that of a Brahman for his texts; and his book, as it deserves to be, is already a classic. But Caxton left neither letters nor journals, and but scanty materials of any kind for a biographer to work upon; and his life is best known by his works, and by such glimpses of his contemporaries and his own personal experience as are given in the delightful introductions he wrote to his books. The date of Caxton's birth is usually stated to be 1412, but Mr. Blades thinks he was not born before 1422. His place of birth was in the weald of Kent, and, he says, there he studied English, where he doubts not is spoken as rude and broad English as in any place in England. He went to school; but whether in London or in a country school is not known. In the prologue to his Life of Charles the Great, he expresses his gratitude to God for the simple cunning according to which his translation has been made, adding: "I am also bounden to pray for my fader

"and moder's sowls that in my youthe sette me to scole, by "which I get my living I hope truly." After his school days Caxton was apprenticed to Robert Large, a London mercer of reputation, who was Lord Mayor in 1439.

Troublesome times in Caxton's youth were in store for England. Abroad, war with France; at home, starvation and want among the people; a fierce struggle between the nobles; deadly strife for the crown between the Houses of York and Lancaster; and to complete the list of national woe, there were faint, distant mutterings of that storm of religious persecution which in the future would burst upon the nation. Strange sights, foreign to modern life, arrested Caxton's attention during his London apprenticeship. For three alternate days, a dame of high degree, barefoot, taper in hand, clad in a sheet, and followed in procession by Mayor and civic dignitaries, walked the public streets, from the Thames to St. Paul's, in penance for sorceries with the witch of Eye; heads of Kentish "risers" were stuck on poles on London Bridge; and an aged vicar of eighty years was degraded from his priesthood and burnt on Tower hill for Lollardism. Large died before Caxton's apprenticeship ended; and the apprentice was sent to finish his term in the service of the Mercers Company, at Bruges. The London guilds whose names remain to occasionally flit by as spectres from the past, were, in Caxton's day, vigorous promoters of English commerce. Under title of Merchant Adventurers, the English guilds jointly obtained rights by charter, to supervise and control practical working of the commercial treaty made between the Duke of Burgundy and England. Their charter gave them power to elect governors having authority to supervise and control English merchants trading with Burgundy; and to make all trade regulations that were reasonable and within treaty rights. No goods could leave Bruges for England without the seal of the Governor of the Merchant Adventurers Co., who received two pence for each parcel sealed. He appointed packers, as merchants could not pack their own wares, lest prohibited goods should be included; and he had power to call to his aid twelve merchants and mariners, who collectively settled all commercial disputes.

Caxton was at first member, then Governor of the Company of Merchant Adventurers. During his Governorship the commercial

treaty long existing between Burgundy and England ended on November the 1st, 1465. Shortly before expiration of the treaty Caxton and an English diplomat were appointed Royal Commissioners to secure its renewal. They were unsuccessful, and the treaty lapsed. Philip of Burgundy refused to pass another treaty; English cloths were excluded from his dominions; and the English Parliament prohibited the importation of Flemish goods into England. For a time the merchants of both countries saved a part of their trade by smuggling goods indirectly through adjacent countries; but after a year the Earl of Warwick instructed Caxton to see that the act of the English Parliament forbidding English traders from buying goods in Burgundy was carried out. Philip, however, died in 1467, and his son Charles the Bold succeeded to the Dukedom. Edward the IV, of England, adroitly negotiated a marriage between his sister Margaret and the Duke. The wedding ceremonies were held at Bruges in 1468, and Caxton and his company soon after succeeded in obtaining a new commercial treaty.

It was in March, 1468, busy year as it was for him, that Caxton commenced his translation of the "Histories of Troy." When he had translated five or six quires the work was put aside, with no intention to resume it. But after a lapse of two years the Duchess Margaret sent for Caxton to speak with him on divers things, and he told her Grace of the translation he had begun. She bade him shew her what he had written, and, after reading it, she criticized his English, advised him to amend it, and commanded that the work should be finished. Accordingly Caxton's translation into English of the Histories of Troy, which he began at Bruges, and continued at Ghent, was finished at Cologne in the year 1471. At the end of the third book, he writes that his pen is worn and weary, eyes dim, ardour to work lessened, and that age was beginning to make his body feebler. As his book was promised to friends and others as soon as possible, he adds:—"I have "practised and learned, at my great charge and dispense, to ordain "this said book in print, after the manner and form as ye may here "see; and it is not written with pen and ink as other books have "been; to the end that every man may have them at once." The Troy-book was the first book printed in the English language. As forerunner of English printed literature, it will remain a sacred heir-

loom with the rarest treasures of English speaking people. It contains 351 printed leaves, and is nominally a history of the Trojan wars; but mixed up with that history are love stories, myths, and tales of knight erranty, written by Raoul le Fevre, chaplain and secretary to Philip Duke of Burgundy. These stories were popular at the ducal court. Blades says copies of Caxton's Recuyell of the Histories of Troy are in fourteen libraries besides those of the British Museum, Oxford, Cambridge, Sion's College, and the College of Physicians, London. In 1812, the Duke of Devonshire paid £1,060 10s. for a copy of the Troy book.

The early printers made their types to resemble the manuscripts from which they printed, and the Histories of Troy were printed in a text similar to the handwriting of the time preserved in the records of the Mercers' Company. A manuscript written by Colard Mansion's own hand is in the Paris National Library; and an expert says "it is in exactly the same character as the types of Caxton's book." Colard Mansion was a fine manuscript writer at Bruges, and a member of one of the guilds for transcribers. He learned the art of printing about the time it was learned by Caxton, and without doubt he founded the types used by them both for printing their earlier books. The manufacture of manuscript books employed many craftsmen before the invention of printing. These formed themselves into guilds called after St. John, St. Luke, and other appropriate names. One of these guilds was called "Les Fréres de la Plume." Their work found its way into the homes of cultivated nobles, and into all the courts of Europe. Philip, the Good, was fond of learning, and the best artists of Europe found their way to Bruges. His library was considered to be the richest in Christendom. It consisted of nearly 2,000 volumes, chiefly in vellum. They were most tastefully written and illuminated, and were kept in rich bindings, studded with gems and decorated with clasps of chased and jewelled gold. Many of these Ducal books are yet in the Royal Library at Brussels.

Caxton left his Governorship of the Merchant Adventurers, and for a time was a paid attache in the suite of the Duchess Margaret. From about 1472 to 1476 the Troy Book and the Chess Book, it is thought were printed at Bruges, by means of Mansion's technical skill, and Caxton's translations and money. Blades concludes that

Mansion, afterwards without Caxton's co-operation, printed in French the "Troy Book," "Jason," and the "Meditacions," with similar types used for Caxton's two books. About 1476 a new font of types of slightly different character was brought into use by Mansion, and before Caxton took them with his printing outfit to England, they were tested by printing with them "The Quatre Derrenieres Choses." A year later Caxton had established an office in England. The "Dictes and Sayings of the Philosophers" were printed by him at Westminster in 1477. It is the first book in which Caxton directly and plainly gives time and place of printing, and many think it is the first book he printed in England. Caxton's advertisement of "pyes," or guides to the Easter Feast and Saints' Days, has been preserved. It was issued soon after his arrival in England. In modern spelling it reads: "If it pleases any man, spiritual or "temporal, to buy any 'pyes' of two or three commemorations of "Salisbury use, printed after the form of this present letter, which is "well and truly correct, let him come to Westminster in to the "Almonry of the Red Pale and he shall have them good cheap.' The words "Red Pale," beyond doubt, refer to the sign at his printing office; as their heraldic meaning is a vertical red band painted down the middle of a shield a third of its width, and many of the early printers took some heraldic device for a sign.

From 1476 till his death in 1492, for fifteen years, Caxton translated and printed books in England. Including his work on the Continent, he was engaged in printing less than twenty years. During that time, according to Knight, he printed sixty four books; but Blades, with fuller information, places the number of his works, including reprints, leaflets and small books at ninety-nine, without reckoning two or three that are doubtful. Many books printed by Caxton have no doubt been lost. Of those remaining, seven are fragments; and of thirty-one, but a single copy of each is left. "The Polychronicon" and "The Golden Legend" are the two books from Caxton's press less rare than the rest; of these, thirty copies of the one are preserved and thirty-one of the other. The British Museum possesses eighty-five Caxtons, more, as is seemly, than are in any other collection; but twenty-five of these are duplicates, and the fifty-six Caxtons collected by Earl Spencer are held to be the best and nearest complete collection made. After patient

investigation, Mr. Blades concludes that Caxton printed his books, come down to our time, from eights fonts of types, of five separate cuttings, made after three somewhat different styles of letters; for chronological convenience, in his life of Caxton, they are designated by numbers from one to six. Twelve of Caxton's books bear the imprint of his device and initials The device was formerly thought, by a fanciful arrangement of Arabic numerals, to designate the year 1474; but similar characters have been found on the tomb of a member of the Mercers' Guild, and among the contraction symbols used in Doomsday Book. The seal used by him during his mercantile Governorship at Bruges likely suggested its use, and may have resembled it.

Of Caxton's chief printed works, besides the Troy and Chess Books, may be named:—The Canterbury Tales of Chaucer; Boethius; Reynard, the Fox; The Fables of Æsop; Chronicles of England; Higden's Polychronicon, and the Golden Legend. Altogether he printed in England, excluding his work at Bruges, 18,000 pages, most of them of folio size; and of these 4,500 pages were translated by his own pen. In his will Caxton bequeathed for the benefit of his parish church fifteen copies of the Golden Legend. These sold at an average price of six shillings and eight pence a copy, a sum equivalent to about $13.00 of modern money. That was not an exhorbitant sum for a large illustrated book printed—as each of his books was—in a small edition. A luxurious edition, limited to 300 copies, of the same book as originally printed by Caxton, has been recently printed at the Kelmscott press of the poet Mr. William Morris. The price for the set of three volumes is £10 10s.

Caxton understood the French, Dutch and Latin languages, and wrote crisp, vigorous, idiomatic English. As first printer of English books, his work has received frequent comment, fair appreciation, and some criticism. In his address on history, Gibbon expresses regret that Caxton, forced to comply with the vicious taste of his readers, printed mawkish stories for the idle, and superstitious legends for the credulous; that the world is not indebted to England for a single first edition of a classic author; and that when the father of printing gave his patrons a work on history, instead of printing Higden's Chronicle in Latin, as he should have done, he only ventured

on the English translation by Trevisa. Such criticism from Gibbon startled his readers, but did not change regard for Malory's Legends and Chaucer's Tales. It is singular that Gibbon should have underestimated Caxton's contributions to English literature, or the relative importance of his mother tongue. But the brightest mirror has some fleck, the human eye itself has its tiny blind spot; and Gibbon, to whom the secrets of the past stood revealed, so dimly foresaw the future of his own language, that, but for Hume, he would have written his history in French and not in English. The literary taste of our day is not that of the time of Gibbon. Our censors and guides think it singularly fitting that Caxton preferred his mother tongue, and did not turn his back on the perfect portraiture of English life and character furnished by Chancer's Canterbury Pilgrims. German, Italian and French printers surpassed Caxton's work in mechanical niceties of the printer's art; but his shortcomings in those particulars were more than made up by special merit in other branches of his calling. He worked with persistent varied industry; and his books, printed in the everyday speech of the people, have become the corner stone of the foundation for a great literature. When his services are fairly appraised, none of his contemporaries in the printing art will be found to surpass him in merit. His name is interwoven with his country's history; and in his own words: "Other monuments "distributed in divers changes endure but for a short time or season; "but the value of history diffused and spread by the universal world, "hath time, which consumeth all other things, as conservatrice and "and keeper of her work."

In the 126 years from the time Caxton printed the Troy Book to the year 1600 there were 365 printers in England and Scotland, or foreign printers who supplied England with books. During that time they printed ten thousand distinct works, an average of nearly 80 books a year. But the acorn, if slow to germinate, became a sturdy oak. The art "which has conferred immortality on the works of man" has grown with the spread of knowledge, kept in perfect touch with industrial invention, and has made art, chemistry, and mechanical science its handmaidens, ministering to its progress. In 1892, six thousand two hundred and fifty-four works were published in England; an average every four days of the number issued each year of the XVIth century. In the great libraries of the world books are

aggregated in such numbers that trained men are puzzled to care for them, to catalogue them, and make them accessible to readers. Special investigators of each branch of art, natural history and other sciences, have had for convenience sake to establish collections of books pertinent to their own pursuits. Brunet's Manual, a guide to only the best and rarest printed books, fills seven closely printed volumes of nearly 1,000 pages each; and the general trade catalogue of Mr. Quaritch, the bookseller, makes six full volumes, and sells for £12 12s.

Step by step, with increasing readers, the press acquired influence, and has become a great power permeating the entire ramifications of civilized life. Free institutions and crass ignorance are antagonistic. They cannot long subsist together, and for safety of the commonwealth popular governments dare not overlook the duty of public instruction. In discharge of educational functions, books play an important part, and books have few enemies in free countries. But no mere facility of reading books glibly can make men for truth, bravery, and devotion to duty, better than their more unlettered ancestry. Many a man with but little book learning has led a blameless life, and conferred untold benefits on his fellows, while thoughtless, selfish and depraved men, have made literature an in strument for their own destruction, and a stone of stumbling and cause of evil to others. No graces of genius countervail against the evils of a bad book, and exhalations from the moral filth of the world are more noxious to the soul than emanations from the deadliest plague centres are to the body. Books, like all blessings enjoyed by mortals, may be perverted and become a bane. Yet the harm fairly attributable to a free press, compared with its service, is but as a drop to the ocean. He who has access to a good library holds a key, which used aright, will open caskets of richer treasures than are stored in the jewel chamber of an Eastern prince. No human agency has done more than has been done by books to make the world better, and none has added more to the sum of human happiness. Books are faithful untiring monitors, who, if consulted in a right spirit, will yield endless information in regard to the world we live in, give some conception of the great cosmos of which this world is but a part, and reveal truths of highest moment concerning the history, capabilities, responsibilities and destiny of man.

THE KINETIC THEORY.

Read before the Hamilton Association, Jan. 11th, 1894.

BY W. LASH MILLER, B. A., PH. B.

In the middle of the seventeenth century, twenty years after the death of Galileo, Robert Boyle, an Irish gentleman of means, one of the founders of the Royal Society and a man in many respects much in advance of his times, was engaged in improving the newly discovered air-pump. Some experiments on the expansion and compression of air, made in this connection, he published under the title, "Experiments on the Spring of the Air," and the fact then established, viz; that the volume of a given quantity of air, at any given temperature, is inversely proportional to the pressure on its containing envelope, a rule shown by subsequent investigations to hold good for other cases, formed the foundation on which the special theories of the constitution of matter were afterwards built. This paper did not however attract much attention at the time, and the achievements of Newton, a youth of twenty when the "Spring of the Air" was published, monopolized for a time the attention of the scientific world, and gave an impulse and direction to the study of physics which have lasted down to our own day.

Influenced, no doubt, by his great contemporary's recent success in the fields of astronomy and optics, Daniel Bernoulli, one of the more celebrated mathematicians of the time, endeavored by means of a mechanical hypothesis, to account for the behavior of gases and more especially for the relation between pressure and volume discovered by Boyle. Air, being invisible and known only by the resistance it offers to moving bodies, its weight and its other properties, might, in the absence of any direct evidence on the subject, with equal right be regarded either as filling uniformly all the space occupied by it, as water seems to fill a glass, or on the other hand as consisting of a number of small particles separated by

empty space, something like a heap of sand in a vacuum. Bernoulli pointed out that such a heap of invisibles and whose grains were endowed with the property of mutual repulsion, would resemble air in occupying all accessible space and in pressing against the walls which hindered its expansion: as an alternative to this assumption of the otherwise unknown "negative gravity" he suggested that the same phenomena might be accounted for by supposing the gas particles or "molecules" (literally "little heaps") to be endowed with rapid motion, it can easily be seen that the pressure caused by the bombardment of these bodies against the walls containing them would be *caet. par.* greater the more of them there were in a given space, and Bernoulli actually succeeded in shewing that "Boyle's law" would hold for a gas built on this plan, by means of a mathematical investigation of the properties of a system of (perfectly elastic) bouncing balls.

Of these alternate hypotheses the latter only has proved capable of further development, and under the name of the "Kinetic Gas Theory" (from a Greek word signifying *motion*) has played a great part in the physics and chemistry of the present century. Important as this theory was destined to become at a later date, for almost one hundred and twenty years it remained practically without fruit, most people finding it easier to take for granted the simple relationship discovered by Boyle than to accept the existence of a devil's dance of unseen molecules offered as its explanation. During this time however the increased use of machinery was daily attracting its owners' attention to the fact that wherever two parts of a machine rub together they are apt to get hot; this formation of heat by friction, though familiar enough to-day, seemed then so strange that at the beginning of this century the King of Bavaria, his minister, Count Rumford, and a score of notables, watched for over two hours, with ever increasing interest, the signs of heat generated by grinding a blunted borer against the metal of an unfinished cannon in the Arsenal at Munich, and when some water placed in the cannon tube finally began to boil their astonishment and delight knew no bounds. Letters were at once despatched to England (where Sir H. Davy had been for some time engaged in similar work) and elsewhere, informing the world of this wonderful experiment, which, once fully confirmed and rightly interpreted, was fated to overthrow the 'material' theory of heat, till then generally accepted.

This experiment having destroyed the prevalent theory of heat, was naturally looked to for hints as to a new one, and about the middle of this century a number of physicists almost simultaneously suggested that the heat which is formed when motion is hindered, might itself be considered as motion of some sort. Bernoulli's gas theory was eagerly seized upon as affording the necessary basis for re-construction, and from the day that heat was "explained" to be the "energy of molecular motion" may be dated the modern revival of the Kinetic Theory.

It was now easy to see why the pressure exerted by a gas should increase when the gas was warmed, for if the molecules flew faster (and that was the new explanation of the rise in temperature) they could not fail to strike harder on the walls of the prison. A calculation of the rate at which these bodies must be moving, if the pressure of about 15 pounds per square inch exerted at ordinary temperatures by one ounce of air confined in a space of one cubic foot is to be accounted for by the bombardment of its molecules against the walls, gave 525 yards per sec. a result which was not only surprising in itself but which seemed to conflict with well known facts. Ought not the perfume of a plant or the noxious odours of a chemical laboratory to spread with incredible swiftness across the small space of a room if the molecules of the gases composing them were really moving at so unheard of a rate? This discrepancy was, however, soon seen to be the result of a misunderstanding; the motion of the molecules might well be very swift and yet their progress in a straight line—hindered as it must necessarily be by the numerous collisions of one against the other—comparatively slow. A mathematical investigation of the question showed that, in order to reconcile the calculated velocity of the individual molecules with the observed rates of diffusion of one gas into another, the "mean free path" or space through which an air molecule may hope to travel before running against a neighbor must be extremely short, on the average about half a millionth inch, or in other words, in a second it must undergo between four and five thousand million collisions and as many changes of direction.

The chance of a collision is, however, obviously greater, the greater the diameter of the particles (imagining them for simplicity's sake to be spherical in form), and an enquiry into the whole subject

by the methods of the mathematical theory of probabilities (whose success in solving the practical problems of life insurance may be cited as evidence of its reliability), has led to the conclusion that the molecules in one cubic inch of air, if spread out side by side in a single layer, would cover a surface of thirty-five square yards.

In the meanwhile a careful repetition of Boyle's experiments on the compression of gases, had shown that his "law" was to be regarded merely as an approximation to the truth, neither air nor any other gas behaving strictly according to its requirements. This discovery which seemed at first sight to remove the whole foundation from the Kinetic Theory, directed attention to the fact that in the earlier calculations of Bernoulli no note had been taken of the space filled by the gas molecules themselves, and it was found that the deviation of air from the strict letter of the law of Boyle could be accounted for by assuming that the molecules in three thousand cubic inches of air actually occupy one cubic inch, the two thousand nine-hundred and ninty-nine cubic inches being the "empty space" whose quantity varies inversely with the pressure. Thus by adding a little to the precision of the theory, its annihilation by experiment was avoided, or as its enthusiastic champions put it facts which seemed at first to threaten the very existence of the theory, proved in the end but a means of penetrating still further into the secrets of the molecular world.

Once given the actual volume of the molecules in one ounce of air and the maximum area they can be spread over, a simple process of division is all that is necessary to find the diameter of each individual and another to arrive at their total number and the weight of each. The diameters and weights turned out, as might be expected, very small—17×10^{-9} 1 inches and 10^{-21} grains respectively; the total number very large about 3×10^{20}.

In this short sketch I have purposely avoided attempting anything like a full account of the modifications and applications of the theory (such for example as its prediction of the specific heat of mercury vapour), my wish being merely to give some idea of the means by which the various "molecular dimensions" have been arrived at. Some general information on this point is important because there has always existed a large class of admirers of this Kinetic Hypothesis, who not knowing how these values had been

obtained, held it a most wonderful thing and a conclusive proof of the "truth" of the hypothesis and of the "real existence" of molecules, that from the molecular diameters it was possible to calculate the rate of diffusion, from the molecular volumes the variation from the law of Boyle, etc. etc., calculations which obivously are a mere retracing of the steps by means of which these quantities themselves were originally deduced.

Such vagueness of thought with respect to a scientific matter is due no doubt almost entirely to the fact that the development of the conception from the days of Bernoulli down has been in the hands of professed mathematicians, men whose writings are unintelligible to all unfamiliar with the infinitesimal calculus, and lest we should deem it strange for men to take an interest in and even to hold pronounced views on a subject which from its very nature they could but unperfectly master, it is well to consider how few could be found in a large city capable of giving a satisfactory account of the grounds on which the prevalent views on the solar system are based, though fewer still perhaps doubt their substantial accuracy. The conceptions of the Kinetic theory were insensibly and vaguely extended from the case of gases (for which alone they were first developed) to include all state of matter: for do not liquids and solids expand on heating? are not phenomena of diffusion as common among liquids as among gases: and should not the same process in the different cases be explained by the same mechanism? At the same time a certain enthusiasm on the part both of the developers of the theory and of their audience, added to the inability of most of the latter from want of a mathematical training, to take active part in the discussion, gradually led the teachers to teach and the hearers to accept the hypothetical premises of the theory as established facts; the molecular world became a world of realities, and in striving to reduce all physical phenomena to the interaction of the laws of motion and of attraction the Kinetic Theory posed as "the Astronomy of the infinitely small." Tyndall's book was entitled "Heat as a Mode of Motion." O. E. Mayer, after much warning against "mere uncertain hypotheses," says it is "proved beyond all doubt" that heat is a kind of motion. And now in Canada in a book intended for the instruction of youth in our high schools in Ontario we find the conception of "molecules" introduced in the first

chapter, not based on the historical foundation of the behaviour of gases but as following almost by necessity from the fact that sugar will dissolve in water. In 1847 the Royal Society rejected the first modern article on the Kinetic Theory (by J. J. Waterston) with the curt judgment "nonsense." In 1892 the paper, discovered in a pigeon hole, is published with apologies; the hypothesis itself is accepted by perhaps the majority of scientific men as a fundamental "fact" underlying all chemistry and physics, and the story of the molecules is appointed to be said or sung in universities and high schools throughout the land.

Now if there is any one thing that the history of science teaches, it is that as soon as an hypothesis forsakes its proper sphere and becomes enthroned as a dogma, trouble is sure to ensue. In this case as in others the first signs were noticed in the obstinate resistance offered to any modifications in detail by which the hypothesis might be accommodated to newly discovered facts. The behavior of matter in dilute solution (in water, etc.,) resembles in many respects that of the gases we have been considering, but all attempts to bring the molecular hypothesis into shape to account for these phenomena were long resisted by the large majority of chemists; instead of rejoicing that that their 'only true' faith had conquered another world, every effort was made to discredit its recent extensions,—as if the very life of a theory did not depend on its adaptability to newly discovered classes of facts!

A marked change, however, has recently come over the attitude of the more prominent scientific men with regard to this subject, and perhaps what has hastened it most is the recent rapid growth of of Thermodynamics, a science which, recognizing no special theory of matter, has succeeded in arriving at the most varied quantitative relations among physical phenomena merely by following to their logical conclusions a few experimentally discovered natural laws. These laws (more especially the two so-called "main principles") and the consequences deduced from them have been found to apply as well to the most complicated chemical processes as to the simplest physical changes (of the melting of ice and the boiling of water), and the complete qualitative and quantitative identity of chemical and physical phenomena has thus been clearly manifested. Now although this identity had long been preached by chemists and others, it was

mostly in abstract general articles and in the prefaces to their books; in the works themselves a very sharp line of demarcation was commonly drawn between "physical" and "chemical" processes, and the Kinetic theory had contributed to popularize this erroneous' distinction in the same way that it had added the growth of correct views on other matters, viz., by offering a plausible "explanation" in molecular language. Thus in O. E. Meyer's "Kinetic Gas Theory," after an enumeration of the various possible movements of the molecules and of their constituent atoms, we find him developing the idea "that physics busies itself mainly with the mechanics of the molecules, chemistry with the equilibrium of their parts." We can of course reject this distinction, which is in no wise a necessary consequence of the fundamental assumption of the theory, but we have still to meet the indubitable fact that the gas theory is very often unable to account for relations now well established experimentally, which Thermodynamics had foretold in advance of experimental evidence. To this it may be added that just as modern geometers can demonstrate the certain failure of all attempts to square the circle or twist an angle by means of the methods of Euclid, it is gradually becoming clear that the Kinetic hypothesis in its present form, representing physical phenomena as the reaction of a purely mechanical system, can hardly hope to arrive at the results involving the "Eutrophy principle" of Thermodynamics, and, for instance, as the mutual dependence of vapor pressure and heat of vaporization, the connection between the freezing point of a solution and the latent heat of fusion of the solvent, between the minimum heat given out in an electric battery and the temperature co-efficient of its electro-motive force; relations which to-day form the framework of chemical energetics.

This recent progress has of course sadly shattered the belief in the all-sufficing nature of the Kinetic Theory, and will in time restore it to its proper position as an hyhothesis, to be employed so long as it proves useful and capable of alteration and modification to suit newly discovered facts, at some future date to share the fate of all Hypotheses, when, recognized at last as merely the symbolic representation of a part of the truths of some larger more general conception it will be thrown aside without a regret, its duty done, its usefulness at an end.

In the meanwhile the language of the Kinetic Theory is almost indispensable in teaching Science, and probably for a long time yet the song of the molecules will continue to be sung; but more stress than at present customary should be laid on the fact that this theory is *merely* a theory, an hypothesis, a metaphorical representation of nature—bearing the same relation to the truth that a power diagram does to a steam engine,—and that it is not in any sense to be regarded as a "discovery of the inner life of matter."

SOME PHENOMENA OF SOUND.

Read before the Hamilton Association, Thursday, April 21, 1894.

BY J. E. P. ALDOUS, B. A.

Before proceeding to the special consideration of sound as it appears in music, it will be well to consider the property of sound pure and simple. Years ago a friend of mine, who was addicted to suggesting perplexing conundrums for his own amusement and the confusion of his friends, made the statement to me that sound does not exist, unless some one is present to hear it. Now, it depends on what you mean by sound whether or not this is true. Every one has heard the vibration of a violin string or piano string when it has been set in motion by bow, hammer or finger. Were it not for the sounding board, very little sound would be heard from such vibrating string; but, a suitable sounding board being provided, the vibrations are communicated by the string to the sounding board, which gathers them up, amplifies them, and transmits them to the surrounding atmosphere, where they go on circling out and out, like the ripples caused by a pebble thrown into water, until they reach something that prevents them going further, or till they disappear through attenuation. If these vibrations reach the drum of an ear, a sensation is conveyed to the brain and we say we "hear a sound," *i. e.*, the brain is conscious of certain air-vibrations having impinged on the tympanum of the ear. So, if by "sound" you mean the sensation of vibration, my friend's statement was true; if by sound you mean the vibrations of the air, they exist under the circumstances that excite them, whether any person is present to perceive them or not.

A short while ago Dr. A. Wilford Hall, of New York, propounded a theory that sound was not a wave or vibration affair at all, but is a substantial something that is communicated from whatever generates the sound through the medium of the air to the person who perceives it. As our time does not allow us to fully

consider two different hypotheses, we will confine our attentions to the results of the investigations of the most renowned scientists who have worked on the subject.

Let us, at the outset, establish a distinction between musical tone and mere noise. Noise is sound in which the vibrations are irregular and uneven; tone, that in which the vibrations are regular and uniform.

Air-vibrations can be started by the vibrations of (a) a string, (b) a metal or wooden tongue, and (c) a jet of wind leading to the air contained in a pipe open at one end or at both.

To illustrate the vibrations, consider a row of boys standing one behind another; if some one pushes the last one, that sends a pressure from him to the next, and on to the next and the next and so on until it reaches the last one, who, having no one else to push, goes over. As each push goes on to the next boy there will be an almost imperceptible pull-back or reaction, just as a pendulum pushed to one side will swing back past the stationary point. The push of the boys we call a "condensation" or closing up, which leaves behind it an "expansion" or stretching, which will be seen in the action of the air inside an organ-pipe. As soon as the wave of condensation has passed out at the end of the pipe the reaction behind it has prepared the way for a new wave to begin. To consider the row of boys again: If the boy at the end of the row is facing a wall, he will not fall over, but will push at the wall; thus a reflex wave of push will be sent back along the line. So, if the organ-pipe has a stopper in the end of it, the air of condensation cannot get out, but is turned backwards, and there is no room for a new wave to begin until the first one has reached the mouth again; in other words, each wave has to travel the length of the pipe twice if it is a "stopped pipe" I shall have occasion to show that by an instrument called the Siren we can prove that any sound has twice the number of vibrations of the sound an octave below; hence we derive the fact that a stopped organ pipe sounds an octave below an open one of the same length.

The larger number of pipes in an organ are of this flue kind, the principle being precisely that of an ordinary whistle, where the vibrations are started by a jet of air being thrown against a sharp edge, across which it vibrates like a flexible tongue.

While speaking of the organ we will next take up the "reed" section—that is, the starting of the vibrations by the action of reeds or metal tongues. To describe this, take (in fancy) a small reed or pipe; shave off one side of the stopped end until an aperture is made; put a tongue of thin wood or metal over this opening and fasten it to the end farthest from the end of the pipe. If you try to blow into the end the air will have difficulty in getting through the aperture, and the spring of the tongue will start a vibration which will produce a note determined by the number of vibrations made. If the tongue is wide enough to lie on the edges of the aperture it is called a "striking reed," if it is narrow enough to pass through to and fro it is called a "free reed." Most organ reeds are striking reeds, as the clarionet, oboe and horn. The orchestral oboe and bassoon are on a somewhat different principle, or rather different adaptation of the same principle. The entrance to the pipe is almost filled up by two thin tongues (called reeds) which meet together and spring apart again under the influence of the current of air which is striving to enter the pipe. In all the cases mentioned the vibrations started would have very little effect if they were not caught in a tube or sound-box of some kind, so as to be amplified before being transmitted to the surrounding atmosphere.

We will now consider the starting of sound by means of a stretched string or wire. If a wire is stretched tightly between two points it will, if disturbed, start a vibratory motion that will gradually diminish until it returns to rest. The number of vibrations will depend on the length of string, its thickness, and the tightness with which it is stretched. When it is tight enough to make sixteen or more vibrations per second, it becomes a musical note. It will, however, make but little sound unless it has a sound-board or resonance chamber in connection with it. The same applies to the tuning fork, which forms tone by vibrations of the prongs, and is barely heard until the base of the fork is applied to a sound-box of some kind.

Several interesting and instructive experiments can be made by the aid of the machine called the Siren, which help to establish many facts in connection with sound and its action. Imagine a pipe conveying a current of air or steam; this pipe is opposed to the flat surface of a disk (metal, wood or cardboard) which revolves on

a centre; in the circle described by the spot where the pipe meets it are perforated a certain number of holes; and the mechanism for twirling the disc is such that you can tell exactly how many revolutions it makes, however fast it may be going. When the current of air is turned on and the disc revolves, at first nothing is heard but detached puffs as each hole passes the end of the pipe and allows some air to go through; the puffs get more rapid until the untrained ear can count them no longer, and soon they develop into a low hum of a decided note; the quicker goes the wheel the higher goes the note until a high velocity produces a perfect scream. By this it is proved that musical tone is nothing more than a succession of regular vibrations above a certain speed; that the lowest number perceptible as tone by the average ear is 16 per second; also that double that number makes the sound an octave higher. In a modern piano the lowest A has 27½ vibrations per second; each octave doubles that until the top A has 3520. How much music there is in these very high notes is an open question. These numbers, however, are proved with mathematical exactitude by this ingenious contrivance.

Having briefly considered the various means of starting musical vibrations, we come to the consideration of their transmission through various media, taking air as the first. Recognize, to begin with, this definition with regard to musical air waves: The pitch of sound (*i. e*, its acuteness or gravity of tone) is dependent on the length of the waves in the direction of their travel; the loudness of the sound is dependent on the amptitude or width transversely to the line of travel. The instrument which initiates the tone establishes the pitch (which remains unaltered) and, to a certain extent, the loudness too, though that will be materially altered by the medium through which it has to pass and the distance it has to travel. The pitch will sometimes be slightly altered, as a piano will sometimes sound out of tune when heard through a wall.

Sound travels through air of ordinary temperature at about the rate of 1140 feet per second—380 yards. The colder the air the slower the travel, warmer air faster travel; a difference, roughly, of one foot of speed for each degree of heat or cold. Light travels at the rate of 200,000 miles per second. So, as this means that all terrestrial distances are covered by light practically instantaneously,

the knowledge of the speed of sound enables one under certain circumstances to measure distances. You see the flash of a distant gun and some seconds later you hear the report—the number of seconds, 380, gives the number of yards distance. You see a flash of lightning and you count the seconds following—4⅔, or call it 5, seconds tell you that the storm is one mile distant and you are safe for the present.

The amptitude of loudness is dependent on the density of the atmosphere in which the sound is started, not on that in which it is heard. The atmosphere on the top of Mount Blanc is about half the density of that on the level. Two guns of equal calibre fired one on the summit and one on the level would have very different effects. The one fired in the dense atmosphere below would most likely be heard above; but the one fired in the lighter air above would start such feeble vibrations that they would be very unlikely to travel far.

An interesting experiment can be shown by suspending a bell in an air pump with an attachment by which you can ring the bell. As the air is withdrawn the ringing sounds fainter and fainter until it becomes inaudible. If hydrogen gas is let into the bell it does not help the sound, because it is such a thin and very elastic gas that the air vibrations get no support to travel on. If the lungs are filled with hydrogen and the subject attempts to speak, the resultant voice is a mere squeak. Whether this is because the vocal chords starts vibrations in the light hydrogen and therefore sound weak, or the hydrogen is unable to excite more than a feeble vibration of the vocal chords is a matter to be decided by the laryngoscope.

The velocity of sound in water is more than four times its velocity in air; its velocity in iron, 17 times; its velocity along the fibre of pine, 10 times. The reason is that the elasticity of these substances as compared with their respective densities is vastly greater than the elasticity of the air compared with its density.

As we have more experience of the travel of sound through air than through any other medium, we will consider the different conditions of air and their effect on the transmission of sound. As before noted, sound travels more quickly in warm air than in cold, the difference being, roughly, about one foot for one degree Fahrenheit.

It is a frequently expressed opinion that foggy atmosphere is adverse to the transmission of sound. Experiments have proved that the reverse is the case; sounds travelling not only further but with greater volume in misty air. It has been proved, however, that there are what are technically called acoustic fogs, viz.: strata or sections of the atmosphere which are almost impervious to sound though conveying to the eye no indication of any difference in quality from the surrounding air. Many experiments at the various gun and signal stations on the coast have given curious and interest ing results in this connection.

A vessel approaching the shore heard a fog signal (a 10-inch steam whistle) distinctly at six miles distance; when it reached a distance of three miles the sound vanished and was not heard again until within a quarter of a mile of the signal.

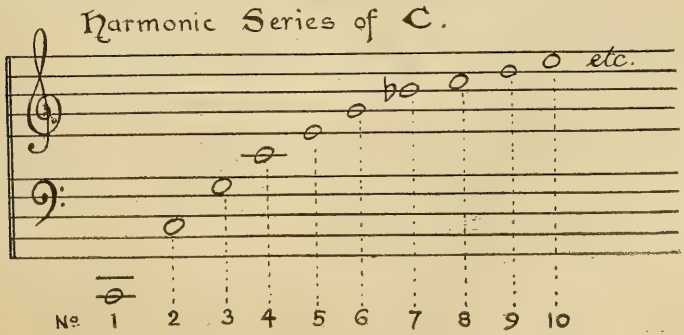
Signals are often heard at a great distance in one direction, while in another are scarcely audible for a mile. This is not the effect of wind, as the signal is frequently heard further against the wind than with it. Difficulties with fog signals arise from the fact that they seem to be sometimes surrounded by a belt of varying thickness of non-homogeneous air from which the sound appears to be entirely absent. This action is common to all ear signals and has been observed at times at all signal stations, at one of which the signal is situated on a bare rock 20 miles from land and with no surrounding objects to affect the sound.

Experiment and observation lead to the conclusion that these anomalies in the action of fog signals are to be attributed mainly to the want of uniformity in the surrounding air, and that snow, rain, fog and wind have much less influence than has been generally supposed. It is on record that at the Battle of Gain's Farm, in Virginia, two men watched the battle from an opposite hill about one and a half miles distant; the day was a mid-summer day of perfect clearness; they saw the musket-fire of both sides and the flash of guns; they watched all the proceedings for two hours of a battle where 50,000 men were engaged and 100 pieces of field artillery *without hearing a single sound.* In the intervening valley was a swamp and on each side of it a clearing, part cultivated and part not, giving conditions capable of providing several belts of air varying in the amount of watery vapour and arranged at right angles to the travel of the acoustic waves.

We will now consider the actions of vibrating strings. If a string (or wire) is stretched tightly between two points and then twanged, it will give a certain fundamental note dependent on the thickness, tightness and length of the string. If it is bisected by a fixed point each section will give a sound one octave higher; if divided at one-third of its length, it will give a note a twelfth higher (*i. e*, an octave and four notes); and it can be proved that a sound an octave higher vibrates with twice the speed of the fundamental note, that the twelfth has three times the speed, and so on, giving us the rule that the number of vibrations is in inverse proportion to the length of string. Again, the number of vibrations will vary inversely as the thickness of the string. So it is evident that in stringing an instrument like a piano, which has strings ranging over seven octaves of pitch, it is a matter of the nicest calculation to grade the wires in thickness, from the heavy covered wires of the bass to the thin wires of the treble, so that the tone may be evenly graded throughout.

If a stretched string is lightly touched at some section, half, third, quarter, or some definite fractional part of its length the rest of the string divides itself into sections of similar length, and this is proved by the fact that small pieces of paper perched on the string at these sections (or nodes as they are called) retain their places when the string is vibrated by a bow, while others placed midway are thrown off immediately.

The observance of nodes, or partial vibrations, found in vibrating strings bring us to a most interesting part of the study of sound, namely, harmonic sounds or overtones. We are apt to think of sounds as just of a certain pitch and certain quality. Now it is ascertained that with every fundamental tone there coexist a number of higher tones called overtones or upper partials.



The number of any note in the harmonic series gives also its number of vibrations by multiplying those of the fundamental tone. These overtones can sometimes be detected by the ear unaided, but they can be plainly brought out by resonators tuned to the notes which are wanted to be detected.

It is the presence of these overtones in varying quantity and power that makes different qualities of fundamental tone. We all know the different qualities of tone of pianoforte, violin, horn, flute, to say nothing of the human voice; and it has been proved that these shades of difference are all due to the presence (with the fundamental tone) of varying strengths of different overtones. One man's mouth and throat differs in quality and shape from another's in various minute ways, which tend to reinforce different overtones in different voices, and produce in that manner the different quality or distinguishing "timbre" of each voice.

It has been discovered furthermore that vowel-sounds are nothing more than different qualities of fundamental tone produced by the same conditions. This has been proved by Helmholz, the great scientist, by an experiment made with flute pipes and tuning-forks of different pitch, representing the various notes of the harmonic series, which are needed to join with the ground tone to make the vowel-sound desired.

Experimenting with tuning forks for the first eight members of the harmonic series, the results were briefly as follows: The prime tone sounded alone gave a dull U sound—duller than possible in speech. The second and third sounded feebly in addition became more like OO. A fine O was produced by making the fourth strong, the second, third and fifth weak, and the prime tone somewhat subdued. O, as in *not*, by making fifth, sixth, seventh, eighth loud and subduing the rest. A passably clear A by making the fourth and fifth loud and subduing the rest, and a sort of E by reinforcing the third and sounding the rest feebly.

In precisely the same way as with the vowel-sounds it is possible to imitate the quality of tone of organ pipes and orchestral instruments. The nasal quality of the clarionet is made by using a series of unevenly numbered overtones; the softer tones of the horn by using the full chorus of overtones.

RESUME.

1. Sound is the result of air vibrations being transmitted to the brain by the ear drum.

2. Musical sounds are the result of regular vibrations, noise of irregular.

3. Air-vibrations are started by vibrating string, reed or fork, but need reinforcing by sound-boards or resonance chambers in order to travel far.

4. Organ pipes stopped at the upper end sound an octave lower than pipes of the same length open.

5. Pitch of sound depends on length (or frequency) of air waves; loudness or amptitude, on width of waves; quality, on the presence of overtones in varying strength; or, in other words, on the shape of the waves.

6. Sound travels, roughly speaking, 1140 feet per second, a mile in nearly five seconds; light at 200,000 miles per second.

7. Sound travels feebly in varied air or light gas such as hydrogen.

8. Sound is not hindered but rather assisted by fog or dampness.

9. Strata of unhomogeneous air will destroy the carrying power of sound.

10. Sound travels four times as quickly in water as in air, 17 times as quickly as in iron, 10 times as quickly along pine fibre, because the elasticity is much greater in proportion to their density.

11. The Siren proves that the pitch of a sound depends on the frequency or number per second of its vibrations. A sound makes twice the number made by a sound an octave lower.

12. The lowest note audible to the human ear has about 16 vibrations per second; the highest 38,000.

13. Vowel-sounds are merely varieties of quality or "timbre," and as such depend on the presence and varying strength of certain overtones.

REPORT OF THE BIOLOGICAL SECTION.

Read at the Annual Meeting of the Association, May 10th, 1894.

We beg to submit the Annual Report of the Biological Section of the Hamilton Association :

Only five regular meetings were held during the past year, but these were fairly well attended and enjoyed by the members.

Our meetings consisted mostly of informal discussions on subjects Biological, and no prepared papers were read.

On January 12th Mr. Dickson gave a talk on Diatoms, using his microscope to show the beautiful variations in form of the different species.

Our good friend Mr. Yates, of Hatchley, sent us several series of notes on animal and plant life, which always proved interesting and instructive.

In November the Section received, through Mr. Alexander, about 400 species of flowering shrubs of Australia from Rev. Thomas V. Alkins, M.A., LL.B., of Campbelltown, New South Wales. Part of these were exhibited last fall at the opening meeting of the Association.

Mr. Walter Chapman, who is now in tropical Florida, sent us, through Mr. Morris, a box of kumquots or Japanese oranges, which are the size of a plum and are eaten skin and all.

Few additions were made to the Herbarium of the flora of this district; but this season we are giving especial attention to filling up the vacancies.

At our Annual Meeting on May 4th Mr. Dickson was chosen Chairman and Mr. Moore Secretary for this year.

All of which is respectfully submitted.

J. M. Dickson, Chairman.

H. S. Moore, Secretary.

NOTES ON BIOLOGICAL SUBJECTS.

Read before the Hamilton Association.

BY WM. YATES, HATCHLEY, ONT.

I.

The exceptionally warm and fine autumn of 1893 has been attended with corresponding effects on bird-life and on vegetation. The heat and dryness of the month of August and of the first half of September parched many of the meadows and pastures, and many springs and rivulets failed to afford their customary water supply. Seemingly from this cause, the large meadow larks and also the shore larks deserted many of their accustomed haunts hereabouts, and only returned when the autumnal rains had somewhat replenished the ditches and water courses. A great number of small birds and quadrupeds are attracted by a spring or rivulet for bathing and other advantages, and of this fact the predatory hawks and shrikes are well aware and pass much of their time on the upper branches of any convenient tree that commands a view of these indispensible resorts of their victims, and it may be an allowable conjecture that the absence of the larks for nearly two months, as referred to above, is to be accounted for by the bird exigencies requiring the presence of large streams and therefore causing migration to an unfailing water supply.

A greater number than the average of days in October were characterized by warm sunshine and a serene atmosphere, and on some of these autumn festivals the gossamer spiders, in woods and bordering shrubberies, appeared day by day in vast numbers—literally in myriads—and their silken, flossy, waving and floating attenuated threads seemed to invade the whole lower atmosphere. Some gossamer fibres seemed loose from any point of attachment and would rise or fall with the slightest breathings of Aeolus. The minute fabricators of these gauzy fibres could be seen moving, as if with balloon powers of ascension, upwards from one spray or branch-tip of an evergreen to another, and the supporting line being only

visible just when a sun ray struck the same at a particular angle, the little spinners seemed to rise by mere levity, or by an effort of will. My brother, who has good eyesight, and who was watching these insects most attentively, declares the gossamer spider to be of a yellowish colour, and in shape and size like a diminutive sheep tick, and that in moving along their wavering threads they plied their legs with great rapidity and nimbleness, reminding him of the deft motion of the fingers of a skillful human knitter.

Those marvelously designed webs of the geometer spider are most frequently met with earlier in the summer. On one calm and bright morning at the beginning of the month of June, 1892, the weather for a number of days previously having been quite rainy, our roadways, as well as the borders of fields near fences, were bestrewn with these ingenious structures; concentric circles of fine thread lines, intersected at symmetrical distances by diverging radii; precision of the angles of junction, and exact mathematical repetition of the various parts and patterns, compelled admiration. The whole of these fabrications had been produced during the hours of darkness, for there was not a vestige of these snares for entrapping the two-winged victims of Arachne that one could observe at sundown the previous evening. The webs of the more common spider of dwellings and barns are woven on a more common-place design; but great intelligence and sagacity is shown in their localization. The innumerable hosts of dipterous insects seek a dimly-lighted or darksome retreat wherein to pass the hours of rest, aware that when daylight returns their intended prey will dart straight for an aperture or knot hole where light is admitted. The discerning spiders select invariably such positions across which to stretch the gauzy network through which the doomed blueflies and buzzing mosquitoes are unable to enforce passage, and so, after violent efforts, die and serve as food material to the ingenious and sanguinary insect weavers.

On one of the many Indian summer-like days which have been interspersed through the present month of November, we were impelled to take a six or seven mile walk through the fields and woods to a spot where some samples of the wildflower known as the *closed gentian** were reported to have been noticed. The weather

*G. Andrewsii.

was bright and serene, and as one passed by the borders of a cedar swamp, the roadside waste was aglow with the profusely clustered scarlet berries of the Canadian holly (*Prinos verticillata*) These vied in colour with the dense-growing adjoining bushes of red osier (*cornus stolonifera*), which also lend a charm to the shrubbery of swampy wilds at this season of the year when deciduous forests are bare of foliage. The brilliancy of colour of the Prinos berries and their great abundance would attach great interest to this shrub were the foliage evergreen and of a more permanent character; perhaps by dipping the fruit-bearing twigs, ere the fall of the leaf, in some gummy or glue-like solution, the great beauty of this shrub for decorative purposes, in floral wreaths and on Christmas and New Year festivities, might be advantageously utilized.

As we passed along by the swamp's edge, bluejays from time to time vehemently screamed a note of alarm, or probably of warning, to their feathered confreres. The jays seemed to be in family parties of fours or fives and interspersed at varying distances along the forest's edge. In one place we saw them regaling on the fruit (or "hep") of the swamp rose (R. Carolina), which here grows in some abundance and has this year blossomed very freely. One of the bluejay's cries bears a close resemblance to the so-called "mewing" of *the hen hawk*, so much so, that only a practised ear is able to detect the difference. But the jay's varying modulations of voice are extensive, and are all indicative of the varying moods or emotions of the vocalizer. The jays have a keen eye for fruits of a pronounced or gay colour, as we see that they quickly espy from a distance the bright red of a withered apple or two that sometimes remain on orchard trees all winter. They, like most of the crow tribe, are nearly omnivorous, and when they alight on an apple tree in winter they search all along the branches, under the folds and fissures of bark for beetles and moths, and are as quick as woodpeckers to detect the hiding-place of any of the insect tribe, and a good beechnut year or a season productive of acorns is, to them, a period of opportunities. They also have a partiality for corn, and a few stalks of corn left exposed in a field will bring groups of them regularly to partake of the bounty in winter time. (A boy resident near here not long ago boasted in the hearing of the present writer that he had trapped twelve or thirteen jays in a steel trap set in his

father's corn crib last winter.) They also are carnivorous, and the frozen carcasses of animals exposed in the woods is sure to be regularly visited by jays in the wintry frost and snows. These birds are amenable to treatment at the hand of an educator. They can be taught what seem to be apish tricks, and in many accomplishments, vocal and otherwise, as will repay the trainer for his pains and trouble, as do the parrot, canary or bullfinch species.

As we came near the hemlock thicket where the gentians were growing, a flock of yellow finches flew from tree to tree, and ere long the terror-stricken cries of an individual finch were heard, as if proceeding from one in the throes of death. Probably a marauding shrike, of which tribe numerous individuals are now perpetually scouring the locality, had seized one of the twitterers and was fulfilling its sanguinary instincts.

The flocks of the yellow finch and of the pine siskin frequent the borders of our thickets where cone bearing trees are found, and make frequent visits to weedy corners or woods or gardens where tall weeds of the compositae or chenopodiaceae order show above the snows of winter time.

But of all the feathered tribe none make themselves so familiar with the haunts of men as the chicadees. These are now beginning to come to the front and revisiting their accustomed food resorts of last February. Their fearlessness and confidence in the friendship of man is one of their singular traits. They are well known in times of intense frost and deep snow to linger around the lumberman's camp, and we are told of their alighting on the shoulder or knee of the woodcutter when eating his *al fresco* dinner; and will even seize a piece of cheese or fat pork when offered to them, as one lumberman said to the undersigned, "nearly as large as the bird itself." The crashing sound of a falling tree in the forest in winter time is suggestive to these and other hardy species of birds of an abundant supply of food, for among the debris of broken branches, denuded bark and decaying wood a varied assortment of coleopterous chrysalid and larval sustenance is provided, and in the winter morning no sooner has the woodcutter struck a few blows of the far-resounding axe than specimens of the nut hatch, downy woodpecker or chicadee will make their voices heard in the immediate vicinity.

On turning to go homeward the gentians were found according to

description, but chilled, and flowers and leaves embrowned with the night frosts of late fall ; but a few roots were dug up and carried away in hope of a future successful growth. Soon afterwards, on crossing a pasture, a shore lark arose in front of us and alighting on a rail fence near by poured from its throat its few rather monotonous, but not " incisive " chirrups (some one has compared the notes of the shore lark to the sound made by the rapid working of the two blades of a pair of scissors.) On a clay hill a short distance from the bog where the itex prinos grew, were seen some low trees of the Hawthorn (C. Coccinea ?) On these the haws were ripe more than a month ago and only a few more remained on the branches. In the adjoining bog another shrub closely resembling the hawthorn, was once very abundant, but seems likely soon to become extinct in this locality. The shrub here alluded to is a *Spiræa prunifolia** ; this and crategeus seem to form the point of contact in the two genera. It has been said that in the natural arrangement, two species, one of each of the two adjoining genera should be *in touch*, and from this point divergent species may *branch* off with gradually increasing differentiation, but still with some affinities of the ancestral type (as in this instance the Rosaceous characteristics.) There are many noted examples of this close, almost merging, kinship in some of our *distinct* (according to technicologists) genera of wild plants.

Whilst gathering our apples this fall my son pointed out to me a small deserted bird's nest. The nest was very small, seemingly not much too large for a humming bird's ; it was probably the summer home of one of the small fly-catcher's, most likely of " Musicapa Zuticilla," as that species was frequently noticed in the environs in the summer months. The nest was in good preservation and seemed fresh and new. The external workmanship was so perfect that the nest was difficult to perceive, unless by the closest scrutiny, that there was a bird nest there at all. The form seemed to be only a slight lump or swelling of growing woody substance on the fork of a lower small branch of the apple tree on which the nest was situated,—the architect had with much pains and good taste (!) placed bits of linchen and gray moss among the interstices of the plaited grass fibres which composed the external portion of the structure, and the work put one in mind of the efforts of a painter who imitates in ochre and

*In recent books this is classed as Pyrus arbutifolia.

other pigments the beautiful graining and shadings of oak wood or mahogany on an ordinary pine door or board. The bird had an evident wish to deceive and to ward off alien and hostile influences by an effort to make believe that there was no bird nest there at all. The pieces of linchen were of the same size and were "stuck in" at the same distances as the same growths on the tree branch. The unities and harmonies had been so well maintained and conserved that one would say that the same mind that conceived the tree conceived and formed the nest, only working by different agencies and instrumentalities.

The imitations in nature are all but innumerable. Not long since, my attention was directed to what at first sight appeared to be a diminutive tree toad, or frog. The marking of the batrachian were all accurately representated, even to the orange colored tinting at the flank and sides. The phenomenon was a moth, with partly closed wings, reposing during day time on the door of a stable. Another common moth bears on the upper surface of its wings, when folded, the perfect representation of a Roman cross in black on a ground of fawn color, and the gilt resemblance of the Greek letter "Gamma" upon the two wings of one of our common moths most people are familiar with.

There has been an unusual number of bland sunny days during the present autumn, with genial temperature continuing well on into the middle of the present month of November. On the 11th day of said month, the piping of the "Nvla" frog was heard repeatedly among the sedges of morassy places, singing in the afternoon sunshine; and the flowers of the dandelion, and in the woods, the blossoms of the late blue violet, (probably "V. Canina, Var. Sylvestris") were common in some places, and asters (A Uundulatus), and late solidagos, and the may-weed, (Maruta Cotula) were seen in flower. Upon returning homeward, towards evening, groups of the dancing, or *gvrating tipulæ gnats*, were seen enjoying themselves on the wing in the calm feeble rays of the rapidly declining sun. These social insect parties move in the most intricate mazy figures, and the assemblages seemed to be at least a hundred in number, and no collisions or jostlings could be detected, although the whole host would suddenly move upward or downward as if by simultaneous impulse. Some aver that a slight buzzing

sound attends these rhymic pastimes of "the gnats at eventide," so that it is probable that these atoms of life are made happy with melody as well as with the grace and freedom of orchestral movement.

II

This winter is proving so far an exceptional one. We here have experienced no pinching cold and we have not noticed our thermometer lower than twelve above zero. We had, however, seven or eight inches of snow in the beginning of December, but blizzard-like winds have absented themselves so far, to the great comfort of farm animals as well as to that of their owners. There was a bland atmosphere on the 23rd of December, and on Christmas Day we had genial breezes and a light thunder storm, and during the week following frogs of two or three kinds were seen in the flowing ditches, and the tree frog was seen hopping amongst the leaves in the woods and a garter snake was noticed sunning itself at noon one mild, clear day near a fence by the roadside; and I have been told by some rabbit-hunting boys that woodchucks had positively been above ground, as their tracks from their burrows were noticed on the thawing snow. This seems to me all but incredible.

One of my acquaintances caught (shot) a fine fox about half a mile from my place beginning of December. It weighed twelve and a half pounds. By report fifteen pounds is said to be about the weight of the largest and fattest foxes here.

A Hatchley fur buyer named Powell—our local storekeeper—two weeks ago told me that he has bought during the present winter 2,400 muskrat skins, 400 racoon skins, 670 skunk skins, 450 mink skins, and upwards of 50 fox skins and two skins of the pine marten. These (the pine marten), it is said, were captured in the Muskoka district. The man told me that many of the fox skins were not in prime condition owing to the very warm fall weather, and they are said to immediately become first-class, in the quality of the fur and pelt, by the advent of frost and snow.

III

The past winter season on the whole has proved a very mild one, and characterized by an absence of violent and cold winds; the month of January was unusually bland with very light snowfalls, and even the big snowstorm of February was accompanied by a

violent wind that had a much higher temperature than the average blizzard, *i e*, about 22 degrees, whereas high winds at as low a temperature as zero are not infrequent during our average type of winters.

Our place was visited on the night or evening of the last 12th of February's snowstorm, by a very large flock of snow-buntings. These, in fact, were a very interesting feature of the storm, and seemed to swirl and career around our hay and straw stack as if their best time of revelry was when the buffeting wind and circling snow eddies were at their maddest fury. Although one cannot help thinking that the flocks of snow-buntings lend a most charming feature to the snowy landscape on one of our calm mid-winter days, the romantic sentiment is intensified when we listen to their concerted, icy chirrupings in regular time-keeping with the gusts and pulsations of the arctic storm. They evidently share and partake of the atmospheric excitement, and, like stormy petrels, give forth demonstrations of revelry at such junctures ; these scenes, on the date just mentioned, were observed by others than the writer of these lines, and make an impression that is not easily obliterated.

On the night of February 23rd, there occurred a very brilliant and extensive display of the aurora borealis, which was noticed and talked about by many people ; in fact this was the most remarkable display noticed here during many years ; the night was clear, but extremely cold (about two below zero here), and it had been observed that mild weather had set in immediately thereafter ; on the nights of the 21st and 22nd of February there had also been weaker displays of the aurora borealis.

On the 26th February weather became mild, and early migrant birds were expected, but the mildness continuing, the first bluebirds were observed here on Sunday, 4th of March, and the first robins were noticed in our garden on the morning of the 6th, and on that date a number of people hereabouts " tapped " their maple trees with favorable results. The mildness continuing, the first frogs were heard piping by my son and others employed in the woods on the 10th of March, which is about two weeks earlier than last year ; meadow larks sang in the sunshine on the 4th of March. Pheasants were heard drumming for the first of the season on the 8th March, have continued since (indicating mating time), the first grackles were

noticed on the 9th, also same date eight or nine wild geese were seen flying westward. The making of maple sugar had by the 9th of March become general, and the whole of the month of March up to date has been abnormally warm, though with occasional frosty nights, and there was thunder on the 5th and on the 17th. The song sparrow was heard singing on the 11th, which is unusually early, and the twittering of numerous shore larks has been a familiar sound all winter.

The pewit fly catcher promptly made their appearance at dawn of day on the 18th,—they were certainly not here at dark the evening previous and the same day the thermometer got up to 66 degrees in a shed that had a northern exposure open.

The kill-dear plovers generally appear some days in advance of the cranes whose advent we have not been apprised of yet, but the plover's scream was heard on the morning of the 12th and has been frequent about the pools of water in hollows of pastures and meadows since the date indicated.

Reddish butterflies emerged from their wintry retreats as soon as maple trees were tapped, and with numbers of dark-colored moths hovered about the sap vessels, attracted by the saccharine odors in sugar bushes. I think it is obvious that the first arrival of bluebirds are pioneer males, who fly northward to the limits of the warmer area, and are rarely seen to alight in their exploration, but a few days afterwards females are seen, and then many courtship rivalries are noticeable; in fact, for days past, robins combatting like game cocks has been an every day phenomenon.

In the course of our employment, when cutting and hauling logs in the woods during the past winter, several ruffled grouse came near to the littered hayseed that had become scattered on the surface of the snow where our horses had been fed on bundles of clover and timothy in the noontide hour, and these birds showed considerable acumen in being willing to come to such a spot when the horses were unattended, but exhibited much wariness and shyness when human beings approach; we have noticed the same trait about these birds when we have been cattle hunting in the woods in summer time; for on going silently and with much caution towards the browsing catttle, a party of pheasants have been sometimes seen scratching among the dried leaves near the bovines without show-

ing apprehension of alarm, and the same observation applies to hawks, bluejays and crows, as well as to some other species of the feathered tribes. The ruffled grouse's fondness for scratching among chaff seems to point to a close relationship to the barndoor fowl (Gallinacean), they own a sort of fellow-feeling with the ferræ naturæ, but are aliens in the presence of humanity.

On one occasion, during last February, an acquaintance of the writer went quite early with his team and sleigh to the snowy woods, and on beginning to load the pieces of cordwood on his sleigh was startled by the violent uprising of a fine ruffled grouse out of the deep soft snow close to his feet; in its fierce rush skyward, the man said that the cap on his head was jostled by the fluttering wings of the bird which seemed to have bivoucked on the spot, under its snowy coverlet. A few days after the events just narrated a little collection of the rejectments of a bevy of quail was noticed one wintry morning near a lumberman's bush road where the bird party had evidently reposed during the night. And on a second occasion a few days subsequent to the above incident, another similar testimonial was observed a few yards distant on the edge of the same trail, the quails having found that the sleigh-frequented track afforded security to the group from the nocturnal bird enemies. It may be here noted that there was a willow thicket in proximity to the sleigh road where the quail party was frequently seen feeding during daytime.

The young of all wild animals do not seem to have an instinctive or inherent mood of distrust or wariness; this trait sometimes, or rather often, seems to be acquired from the tuition of seniors. Young crows, when first leaving the nest, are easily captured, and young foxes when two-thirds grown, having a fondness for gamboling, are not very difficult of approach when sporting together on a fine day near the entrance to the burrow, and old maternal birds show great consternation at the lack of timidity in their fledglings when an enemy threatens.

Mice (either field or house mice) seem an exception to this rule, for during the past winter we admired the acute and agile, mental and corporeal behaviour of some of these very juvenile rodents, the sharp penetrative and apprehensive glance that these bestow on an intruder in their domain, and their almost lightning-like

scuttle to cover, shows how accurately they size up the amount of danger, when their size might suggest that they should be tugging at the maternal breast.

An individual of our acquaintance, at the beginning of this winter, noticed among a large flock of English sparrows two black individuals among the flock, and soon, on the lot paying a visit to his barn, captured the pair of blackamoors. This was at the Town of Norwich, and was talked of as a supposed freak of "melanism," and a few days ago I had the curiosity to walk to the town to interview the so-called rarities; when on entering the doorway of the room, at one end of which hung a cage containing the birds, the oft-repeated and well-known call of the cow-bunting met my ear, for to this species the dusky prisoners belong. Possibly they have been accustomed previously to cage confinement and had been turned out too late to sort with congeners and had taken up with sparrows' society. At any rate, they seem familiar with all the food and other conveniences of a wire cage, and live, thrive and sing as the days go by.

On Sunday, 10th of March, the weather was warmer than ever and the thermometer got up to 68 in a northern exposure, and on this day my neighbor's bees were seen to return to the hive in the evening loaded with pollen. This proves that the skunk cabbage has come up and expanded its flowers. This occurrence is eighteen days earlier than was the case last year.

One of my neighbors was somewhat puzzled on finding about ten days ago a forked fragment of the thick rhizoma of the water or pond lily (perhaps *Nuphor Advena*) stranded on a piece of lowland near the border of a creek that runs through his farm. I have been to look at the strange, odd-looking piece of vegetation, and it seems not a bad imitation of a young alligator thirty or thirty-five inches long, having a very scaly appearance. The man said that had the fragment moved when he first saw it he would certainly have ran away or started for his gun. I have years ago heard of saurian or chedonion monsters being observed in beaver meadows by children who mistook these large roots as they undulated in the swollen streams for reptiles of the above-named tribes.

REPORT OF THE PHILOLOGICAL AND LITERARY SECTION.

Read at the Annual Meeting of the Association, May 10th, 1894.

Since the last report to the Association the Section has held four meetings. At three of these general discussions took place on subjects bearing on the department. At the meeting in March was presented the only formal paper of the year. This was read by S. A. Morgan, B. A., on the subject "The Mental Basis of Poetry." The discussion on the paper elicited so many thoughts on the constitution and nature of poetry that it was decided that Mr. W. J. Sykes, B. A., prepare a paper on "Expression in Poetry." It is expected that this will be read at the regular meeting of the coming week.

The interest in the Section during the past year has not been as strong as desired, but it is hoped that by attaching the literary element to the philological, the Section may add to its membership, awaken enthusiasm in the study of language and thereby increase its usefulness as a factor in general culture.

An unfortunate circumstance occurred in the printing of the proceedings of the last year, viz.: the omission of a paper on "Graduation of Vowel Sounds," by W. Connor, B. A. It is to be hoped that the mistake will be rectified by having the paper incorporated in the proceedings of this year.

All of which is respectfully submitted.

H. P. Bonney, President. W. H. Elliott, Secretary.

GRADATION IN VOWEL SOUNDS.

Read before the Philological Section.

BY J. W. CONNOR, B. A.

When I accepted your Secretary's invitation to contribute a paper to one of your meetings I hoped to be able to command enough spare time to prepare something worthy of your attention. In this I have been disappointed, as well as of the hope of attending your meeting in person and not only profiting by your discussion of my paper but of being cheered by personal contact with men interested in the same great and humanizing study. This latter disappointment has forced me to write on a subject that I had not at first chosen, one however requiring less in the way of oral and black-board illustration. These remarks are offered in excuse for the elementary nature of the subject on which I am writing, a subject, however, which is somewhat akin to one discussed in one of your last year's meetings and one which at least affords another illustration of the fact that a principle in science is often found to lie at the root of phenomena, apparently most unconnected. Perhaps, therefore, those to whom much or all of what I shall be able to adduce is familiar, may feel some satisfaction in seeing phenomena so apparently isolated as the Teutonic ablaut, the Sanskrit guna, the Sanskrit 'Stamm abstufung' and the irregularities of Latin and Greek declension and of certain Homeric forms all explained by the one great principle of gradation.

It would be a waste of time to describe to your section the immense impetus given to philology by the study of Sanskrit grammar, or to point out how later researches into the relations of vowel sounds have been hampered by a lurking disposition to look upon Sanskrit as showing in all essential points the primitive Indo-European type. Yet after all, this was in kind though not in degree much the same error as that which excites Prof. Skeat's wrath, the deriving of English words from High German. For no one dialect, no matter how early its records, can present in all respects the

primitive type from which others have varied. Least of all can the Sanskrit vowel system, which has confounded under the dull sound of *u* in "gun" the three short vowels *a*, *e* and *o*, and has suffered corresponding mutilation in its long vowels and diphthongs, be taken as the starting point in explaining the richer and, as it now appears, far more primitive vowel scale of Greek or even of Teutonic. Accordingly the guna-theory invented by the sharp-witted grammarians of Panini's school left the vowel system of European languages a maze without a plan. Here it will not be possible to do more than state the two discoveries that have led to a more satisfactory explanation. The first is that of Karl Brugmann, viz: that not only do *r* and *l*, as recognized in Sanskrit grammar, assume under certain conditions the functions of vowels, indicated by the characters transcribed as dotted *r*, *l* (Greek *ra*, *ar*, *la*, *al*, Latin *or*, *ol*, Teutonic *ru*, *ur*, *lu*, *ul*), but so also do the nasals under precisely the same conditions, *n*, for example, when deprived of its vowel becoming a "sonant nasal," as Brugmann calls it, written ($^{n}_{o}$) and appearing in Sanskrit as *a* or *an*, in Greek as *a* or *an*, in Latin as *en*, in Teutonic as *un*. The other, needed to show the full significance of Brugmann's was that of Verner, apparently incidental to his celebrated "Law," but really far more wide-reaching in its consequences, viz: that the Vedic accent system was in essentials that existing before the "Dispersion," in other words is *pre ethnic*. These facts, together with the changes undergone by the Velars or back gutturals, show that the Sanskrit vowel system, instead of being primitive, was only a blurred copy of a more finely painted original—an original preserved with marvellous fidelity in the Greek vowel scales and in some measure by those of the Teutonic languages. Starting from these premises we can give a tolerably clear explanation of the "Ablaut," which, so far from being as Earle only five years ago represented, a discovery of the primitive Gothic community, is a fundamental law of Indo-European conjugation, declension and derivation.

We all remember the lists of related words given in the chapter on derivation in our grammars or spelling books such as, bless, bliss; feed, food, fodder: bite, bit, bait, bitter, beetle; and the question whether verbs come from nouns or nouns from verbs settled by *a priori* argument or by a quotation from the infallible Horne Tooke.

Now excluding merely fancied resemblances like *bliss* and *bless* or Earle's connecting the adjective *sheer* with the verb of similar sound, and cases like the derivation of *feed* from *food* by 'mutation' or 'umlaut,' or such as '*bait*,' which, though cognate, show a foreign vocalism, or like *rood*, *rod* are examples of the acting of diverse forces on the same word in different uses. We have left a very important residuum, explicable only by gradation. These words fall into several classes of one of which we find types in the words *bite*, *bit* and *abide*, *abode*. These words are particularly well worth consideration, as they show the manner in which derivation is illustrated by conjugation, and as their cognates throw light on the nature of gradation.

We must begin, however, by tracing the history of their vowel sounds. The vowel sound of *bite* and *bide* the simple form of *abide* now a diphthong was, as you know, a simple vowel in Anglo-Saxon, and that simple vowel in turn was a reduction of an earlier diphthong, for as Brugmann lays down, primitive *e* becomes *i* in the Teutonic languages before an *i* in the same or the following syllable e.g. *thri* (our three) Goth *threis* (*i. e. thris*), = *treis* Skr. tráyas ; stíg-an = *steích-o*. Again the *o* of abode A. S. *a* represents a primitive *oi* Teut. *ai*, as shown by wot, A. S. wât Germ. weiss = *Foida* (*oída*), hence the A. S. conjugation.

bite (1st sg. pres.) *bât*, pl. *biton*, pp. *biten*,
bíde, bàd, " bidon, " biden,

represent an earlier

1st sg. pres. **beito*, pret. **boit*, pl. **bitum*, pp. **bit(e)no*
pres. *beido, pret. *boid, pl. *bidum, pp. *bid(e)no.

With the latter compare its cognate, *peitho*, pf. *pé-poith-a*, pl. ppf. *e-pé-ṭith-men*, and the verbal (though differing in suffix) *pis-tó-s*, and we see that the short forms *bid* and *pith* belong to the plural and the passive participle whether the suffix is *-tó* or *-no*. The reason for this becomes clear if, keeping Verner's discovery [A] in mind, we compare :

Pres. *bíte*, pret. *bât*, pl. *biton*, pp. *biten*, or
pres. *beito, pret. *boit, pl. *bitum, pp. *bit(e)no

with its Sanskrit cognate (using the future instead of the present, which has a different formation)

bhet-sya-mi, pf. *bibhéda*, pl. *bibhid-ima*, pp. *bhin-na*,

where we see that the forms with the short vowel are those before an accented suffix -mà and -nà ; whereas the diphthongs (Sanskrit ê is generally for *ei* or *oi*) are under the accent.

This is the secret of the difference between *bat*, *bibheda*, *bád*, *pépoitha* on the one hand, and *bit-on*, *bebhedemá*, *bidon*, *e-pe-pith-mén* on the other ; in other words, here gradation is a result of accent difference. This conclusion is absolutely certain, being vouched for by Verner's success in explaining by it such differences as :

A.S. weorthan,	pret. wearth,	pl. wordon,	pp.	-en.
O.H.G. werdan,	" ward,	" wurtum,	"	worten.
O.Fr. wertha,	" warth,	" worden,	"	worten.

But can we explain the difference between *beid-e* and *bád*, *peith-o* and *pé-poith-a*? Would it not be a natural supposition that this also is due to difference of accent? This, some writer, Mœller, I think, asserted some fourteen years ago in Kuhn's Zeitschrift, and later on Mr. Sweet has adopted without hesitation. He says, "There are three accents in Sanskrit, raised = acute, unraised = grave, and 'swarita = circumflex. The acute is the emphatic accent, and was either a rising or a high level tone. The syllable immediately following an acute is always circumflex—that is probably a falling glide tone—unless an acute follow. Every syllable before as acute or after a circumflex is grave. And again, in parent Aryan every vowel had a different form under the various accents. The most important of these is the *e/o* series, which is evidently a modification of original *a*. Under the acute accent *a* became *e*, under the circumflex, *o*, and under the grave it was dropped altogether. This would account for *méno*, *memona*, *mémamen* for *memnmen*, and with like treatment of the vowel-element of the diphthong *peitho*, *pépoitha*, *epe-pith-men*, *e-pe-pith-més*, the vanishing of the *e/o* leaving *i*, just as the loss of *e* in *en* (for, as Gustav Meyer says, it is unmethodic to deny the term diphthongs to such terms as *en*, *em*, *el*, *er*, parallel as they are in pathology (so to speak) with *ei* and *eu*) leaves *n*, which, between two consonants, must become the sonant nasal represented in Greek by *a*. So in *binde* (for *bende), pret. *band*, pl. *bundam*, pp. *bunden*, the *un* of the pl. and pret. is the Teutonic representative of the same sonant nasal.

This explanation presupposes that the vedic accent, *bibhéda* for instance, is not original, but that originally the reduplication as

the distinctive element in the word had the accent. This would be only parallel with the undoubted fact that the augment had the accent no matter how many syllables followed it, as in *ácicarat* reduplicated *aor.* of CAR. But as resting on an hypothesis, we can hardly deem it absolutely certain like that explaining the vowel-difference between *bát* and *biton* or *biten*, *pépoitha*, *epepithmen*, *pis-tó-s*. Here we may observe that the Sanskrit guna vowel is really only the strong form under the acute accent or the so-called deflected form under the resulting circumflex.

Our examples have explained two of the six classes of English verbs with gradation which Skeat enumerates, the *fall class* owning its preterit form to contraction of a reduplicated form. These are the *drink class* and the *drive class*, to which *bind* and *bite* respectively belong. The *choose class* is the class with *eu* perf. *ou*, weak form *u*, of which *eleu-somai eileloutha aor. eluthon* is a mutilated example.

The *bear* and *give* classes are but one, their differences being late developed. They answer to the Greek verb with *e* in pres., *o* in sing. pf., vowel dropt if possible in weak form, as *trépo*, *tétropha*, pass. *té-trammai—ra* for sonant *r*. And, without delaying you with details, we may compare the *shake class*, pr. *scace*, pret. *scóc*, pl. *scócon*, pp. *scacen*, with *errágen*, *erroga*, if the presence of *a* indicates an aoristic present. But what of the corresponding cognate nouns? We find in Greek such forms as *dérma*, *phlégos*, *peús-tes*, with the strong root form as the present; others like *tomé*, *loipós*, *klop-ó-s*, *phón-os*, with the deflected root form found in the sing. pf., and others have the weak root form, as *pis-t-ós*, *tí-si-s*, *psud-ró-s*, *makrós* (as contrasted with *mékistos*, with root accent and strong root form.) We find traces of the same thing, though overcome by analogy, in Latin—*precor*, *procus*. But in the Teutonic language it is again very important.

Thus with the vocalism of the pret. sing. we have *bairn*, *barm*, *qualm*, *share*, *trade*, *bond*, *song*, *wander*, *wrangle*, *wrong*, *abode*, *wroth*, *wrath*, etc., answering to Greek words like *lógos* : *légo*, and with weak root forms; *score*, *spokesman*, *bundle*, *drunkard*, *drift*, *sod*, etc. And examples may be cited from Sanskrit, as *bhedá*, *bhitti*, but they do not show the difference between the two diphthong forms. Latin differences in quantity like *duco* (for **deuco*, O.L. *doüco*) and *duc-em* are often examples of grada-

tion. These examples, which might be multiplied indefinitely, show how important is gradation in derivation as in conjugation, and that not in one or two branches of the Indo-European family, but throughout its whole range.

A question naturally arises, are these nouns and adjectives which show root forms similar to those of certain tenses, *derived* therefrom? This would involve great difficulties, as the laying aside of verbal and the addition of nominal suffixes. Rather we should say that the vocalization of the noun is called out by the same accentual conditions as is the vocalization of the similar verb-form. This is plain in the case of those which, like *drunkard*, *pis-tós*, *bhit-tí*, *ducem*, have weak forms. And even in such words as *klopós*, *tomé*, the requisite condition may have been furnished by certain collocations of words For, as Sweet says, "At first all sound-changes are carried out consistently throughout each breath-group without regard to word division" (whence he adds the initial mutations of Celtic and the Sandhi of Sanskrit, comparing even our English *the man*, *the-erth.*) And the words which have acute accent on the *o* or the weak vowel-form may not possess their original accentuation, but may have for some reason changed it. Thus there is an important rule that with the suffix *o* (Skr. *a*) adjectives andnomina agentis are mostly oxytone, as *torós*, *ta-rá*, nomina actionis barytone as *gón-o-s*, Skr. *jan-a*, birth.

As these remarks have swelled to a tedious extent, it would be well to pass to declension. Here we see that Sanskrit and Greek monosyllables have a similar rule being oxytone in the oblique cases other than the acc. (in Skr. also the Locative, but not acc. pl.) thus:

podós,	*podí*,	*pódes*,	*poús*,	*póda*,	*pódas*,	*podôn*,
pat,	pád-am,	padás,	padé,	pádas,	padás,	padam.

But in Sanskrit we find that while the nom. and acc. sing. and nom. pl. have stem *pad* with *à* long the other cases have *pad* with *a* short. Here the principle is plain. The forms that accent the stem have the strong, those that accent the suffix have the weak form of the stem. This is a fundamental rule in Sanskrit declension, every noun of certain wide spread classes having its strong and its weak stem. Thus *pita*, *patér* has strong stem *pitar (pater)* and its weak stem *pitr* (like *patr*) or before a consonant *pitr*, (like *patra* for *patr* in *patrási.*) Here it may

be remarked that the apparent irregularities in Greek are merely the maintenance of the primitive type which in Latin has been wiped out by the influence of analogy. We may add that all appearances go to make it probable that originally the oblique cases, except the acc. and in some degree the Locative, accented their suffixes in all words and not merely in monosyllables.

In the light of this explanation some irregularites so-called appear in their true light as preserving a preethnic relation lost in the bulk of words through the working of analogy. Thus the difference between *zeu* of *zeus* and *diF* of *diós*, are simply like that between *dyau* of *dyaús* and *div* of *div-ás*, etc., the weak form being caused by its immediately preceding the accented suffix. Even the accent of *zeû* is explained by the fact that vocatives when accented always accented the first syllable. A similar recessive accent, by the way, in the *neut. comp. -ion* is a retention of preethnic accentuation. Compare *svad-syaus* with *hedíon* and *hédion* and it will be seen that the latter preserves the primitive accent.

We see, therefore, that the principle of gradation or ablaut, resting as it does upon the shifting accent of preethnic times, far from being confined to Teutonic conjugation, is a guiding principle in Greek and Sanskrit conjugation and declension, and in the word formation of all these tongues. Had time permitted we might have shown its traces in Latin (e.g. as in *fido* (*feido*), *foedus*, *fides*), in Irish (as *ben* gen *mna* cf *Dor. bana*, and *mna-omai*), and in Avestan; but enough has been adduced to show its wide-reaching importance in moulding the primitive "speech-material," and how its recognition throws light upon many obscurities and combines apparently unconnected phenomena into one harmonious whole.

REPORT OF THE GEOLOGICAL SECTION.

To the President, Officers and Members of the Hamilton Association:

The Section, in submitting their report for the year ending May 11th, 1894, desires to intimate that, although the usual interest in the work has been maintained by the members, there has been a slight falling off in the attendance of visitors. This apparent lack of interest by the general members of the Association can in some measure be accounted for when we consider the reason given, that is, "that the papers read are too technical to be interesting to one who is not fully acquainted with the science; but this objection can be fully met when we consider the object of the different sections of the Association, which is to inculcate correct ideas and information in regard to the various branches of science taken up by the different sections. The earnest student of nature should hail with delight the opportunity offered to him of the privilege of being benefitted by the experience and riper knowledge of those who have devoted much of their time, energy and talents upon a subject which they untiringly pursue with so much pleasure and satisfaction. They have learned to read the great pages of the book of nature, and in the study of those papers they rise to a higher contemplation and a fuller appreciation of the irsurroundings, whether it be in the loneliness of the desert, the vast rolling prairies, or the rich wilds of the forest. They will always meet with one or more of the scientific studies to engage their attention. So that technical phraseology should not stand in the way of acquiring useful knowledge and interesting information.

The Section, fully aware of this objection, has endeavoured to meet it, and our worthy Chairman has referred to it in one of his papers, when he claims to have adopted the popular phraseology so far as can consistently accord with the dignity of the subject under discussion. In October last the Chairman received a request from Prof. Charles D. Watcott, of Washington, D. C., for all the varieties of graptolites found near Hamilton, so that as complete a list as it

was possible to obtain would be represented in the new work under preparation, entitled "The Graptolite of North America." These our Chairman supplied. Fossil specimens have been sent to Britain, different parts of the United States, and to Ottawa, Kingston and Montreal. The Section has also had fitted up a set of drawers in which to stowe the duplicated specimens.

The papers read at the meeting of the Section have been very interesting. Some of them are devoted to the tracing of palaeozoic shells up through the successive formation to their present living representatives; some recording and describing important discoveries in the chain of palaeozoic life. Some deal with the question what was once considered problematical whether the Liceophycus was animal or vegetable, but by the aid of some very excellent fossil specimens and convincing arguments of our Chairman, this question has been settled to be the latter. The thanks of the Section is due to the Chairman, who has contributed all the papers read before the Section, and to his untiring exertion in the collection of fossils, thereby adding a large number to the collection now in the museum of the Hamilton Association.

The Section has held seven meetings, at five of which papers were read. Following are the subjects treated in these papers, and the dates on which they were read:

Oct. 28th, 1893.—"Notes on the Field Day of the Hamilton Association," by Col. C. C. Grant.

Nov. 24th, 1893.—"Notes on Fossils in the Glaciated Chert of the Niagara Beds," by C. C. Grant.

Dec 22nd, 1893.—"Are Pot Holes in Rocks Always Records of Running Streams?" by C. C. Grant.

Feb. 23rd, 1894.—"Notes (part 2) on Fossils in the Glaciated Chert of the Niagara Beds," by C. C. Grant.

March 30th, 1894.—"Notes from and on Our Exchangees, Geological and Antiquarian," by C. C. Grant.

All of which is respectfully submitted,

A. T. Neill,
Secretary.

REMARKS ON OUR ANNUAL EXCURSION.

Read before the Geological Section, October 27th, 1893.

BY COL. C. C. GRANT.

As this is the first meeting of the Section since we adjourned during the heated term, a few remarks may not be considered out of place in explanation of what has been done in the meantime. Our annual outing at the Albion Mill Ravine was unfortunately marred by a sudden and unlooked for thunder shower that completely drenched ladies and gentlemen, rendering it possible to add but little to our collection. I ascertained, however, that on the day previous the new proprietor of the Waterlime-Barton beds was busily engaged in working the Marshall Quarry, which he had recently purchased. These are the shale beds.

I concluded it might be as well to have a look at the exposure before the members and their friends arrived at the mill. The prospect of inducing the gentlemen to leave the ladies behind seemed improbable, and the latter, however enthusiastic, could scarcely be expected to travel a considerable distance over stake fences and other obstacles above the mill pond before reaching the quarry. I thought, taking all things into account, it was better to examine it personally than risk the chance of a later visit, and so I started before the others. On my way down to join our party, I raised and split some of the large, thin shale slabs, containing many specimens of that singular organism named by Dr. Spencer, F. G. S., "Phyllograptus dubius." Now, no one, I think, has ever questioned the organic nature of the specimen. On one point, however, the majority of palæontologists are agreed, that the classification is exceedingly doubtful. This was Spencer's own opinion, hence the name—implying doubt.

It is colored black like graptolites, presents no apparent point of attachment, very flexible, of about a dozen separate individuals on the face of a split flag. No two were precisely shaped alike. If free graptolites, it is difficult to account for their crowding together

in this unusual manner. They are probably confined to two layers in the Barton shales, at least they have not yet been found in any others. As in Inocaulis plumulosa (Hall) the rain-like process, frequently noticed, may represent the cellules of a graptolite. A few rather doubtfully appeared to look on it as representing a Marine Annelid. They vary in length, viz., from one to three inches, being flattened in the indurated Niagara shale. The body, or axis, now seems broader than in the natural state before it became fossilized, and indeed it does occasionally assume a worm-like appearance. I was of this opinion for some time, but such forms offer little for preservation in a fossil state. We know the chitonous teeth may be, and have been, preserved in Silurian beds (I think in Cambro-Sil. rocks also), but even comparatively recent ones display no instance where the softer part of an Annelid has been recognized in a fossil state. There are no burrows or trails.

While I am satisfied Dr. Spencer has correctly assigned it to the Hydrozoa, it may be questioned as to what particular group it comes under. I feel inclined to imagine it to be the representative of an entirely new genera. It appears to differ almost as much from the Quebec Phyllograptus as from the Niagara Inocaulis.

Another minute graptolite puts in an appearance in Barton shale, a little below near the Lime Kiln. It seems to be very rare. We may not, as yet, have hit off its headquarters, or specific centre. A few fine slabs of shale, with the two characteristic Barton Fucoids, were also obtained. They usually display rounded branches on the surface of the flags ; they are never found in the same layer, always separately ; one is much slighter than the other ; both belong to the same family group. Perhaps the most interesting find was in the banks of the stream lower down. The fossil bears a marked resemblance to the curved fin-spine of a species of shark. Such phosphatic spines are not uncommon in the chert and limestone beds of the Niagaras near the city ; some, probably, were tail spines of a Crustacean, viz., Ceratiocaris or Colpocaris. Others are so large and heavy, apparently, that it is difficult to see how an ordinary member of the Crustacea could move freely about with such a weight attached. Hugh Miller, in one of his works, stated that the defensive spine of an Onchus had been detached in limestone of the lower Silurian, or Cambrian Age. But the one he referred to was

subsequently found to belong to the Articulata, and not to the fishes (Pisces) at all. Indeed it is generally supposed the latter appeared for the first time in an upper Silurian Sea. A few, however, may possibly have put in an appearance at an earlier date. I cannot remember having ever seen figured a carved tail-spine to a Crustacean, and one can scarcely realize such an appendage.

THE MUSEUM CASES.

In looking over the two cases at the upper end of the room contain our local specimens, you may notice a few additions have recently been made. Hitherto we had no specimens of the rare Conularia of the Niagaras, figured and described by Dr. Spencer under the head C. Niagarifica. The one we now possess is incomplete and probably did not attain its usual size (about nine inches in length.) Another Conularia, also figured by Spencer as a Hamilton Pteropod (Niagara), I did not succeed in getting. It appears to be very rare indeed. I have seen only the one Mr. Turnbull found and one I found many years ago. A third specimen, undescribed, and a single one alone seen, resembles a modern Theca in appearance. It is narrow, sharply pointed at the end, nearly six inches long, and does not present any well-marked ornamental striæ.

The more characteristic Pteropod of the Niagara beds, Conularia Niagarensis, has two representatives in the case. When better preserved ones turn up we can transfer them to the less conspicuous side cases for exchange.

The insufficiency of space for the display of local organic remains has been considerably lessened by the Council of the Association furnishing the Section with the trays we applied for. If I recollect aright, it was proposed originally to have a single complete Brachiopod, or Lamellibranch, duly named and labelled in each small paper box. But internal casts of each valve, showing teeth and muscular impressions, as well as outward marking of shells, are also required by students, independent of varieties in each family, which often widely differ from the original stock.

I would suggest, subject to your approval, to substitute smaller paper boxes for some of the larger ones, and to transfer the accessaries, viz, single valves, to the trays, which appear more suitable for careful examination. We have a considerable number of fossils

in or about this city yet undescribed, like the graptolites. Many of the Polyzoa have frequently been figured from mere fragments. "Their study is thus attended," remarks the late Professor H. A. Nicholson in "Palæontology of Ontario," "with special difficulty," Since there is no class of organisms requiring greater skill and patience in their interpretation, the learned Doctor made the Bryozoans a particular study. He was specially selected by the Director-General of the Ohio Geological Survey to report on the Corals and Polyzoans of the State, and his work proved that no better selection could have been made by Dr. Newberry. He and his friend, Dr. G. J. Hind, discovered in the Devonian rocks of the Province quite a number of Bryozoans new to science. They are so accurately drawn that I cannot see how any mistake can possibly arise regarding them. But, unfortunately, we did not hear of the Professors' arrival until they had left Hamilton, and no person pointed out to them the places where the most interesting fossils were to be obtained. Few collectors would ever imagine that ploughed fields on the Niagara Escarpment were likely hunting grounds for sponges and various other organisms of the Silurian Age. Nevertheless, it so happened here that when the upper chert beds were removed, ground into muddy sediment in fact (which any one may notice on the lower clay resting on the glaciated layers) some of the harder and more flinty nodules successfully resisted the grinding process, and are now found resting on the surface of the glaciated layers. It is quite true that in some instances the plough has turned up the upper beds, near the brow of the Escarpment where the surface soil is shallow; but such was a rare occurrence.

The flint (or chert flake fossils), except occasionally an odd one, are confined to two fields close to the corporation drains, reclaimed swamps, and to a low-lying part of a field in rear of the reservoir. The frost in winter generally exposes the interior, if it holds any organic remains, splitting it into thinner slabs.

I am inclined to think, instead of being washed down from higher ground into the hollows, the chert flakes were deposited by a local retreating glacier. The higher ground, near the Corporation drain, is the base of the new Barton, Niagara beds, hard shales, etc., not like the new chert ones.

Barraude asserted, many years ago, that the graptolites in Europe attained their chief development at the time when the upper

Silurian rocks were deposited there. While the statement was questioned and disproved by leading palæontologists of this continent, I think we are fairly entitled to request a re-examination of the graptolites, for, I think, in our Silurian rocks we can show as many genera and species as ever the Cambrians or even the Cambro-Sils. united have. We laid bare in Canada the same as Barraude discovered in Europe, which is unquestionably of interest to science.

I have to direct your attention to some interesting specimens recently presented to the Museum by Mr. A. Walker. The two beautiful polished slabs of Dalomrtic limestone are a great acquisition to the cases. They clearly demonstrate how such rock material has been built up on the ancient Silurian Sea bottom by fragments of shells, corals, Bryozoans and muddy sediment intermingled before it underwent the subsequent chemical changes. One of the slabs contains an exquisite form of a miniature fern. It was probably a Bryozoan, but I have never seen one resembling it. We are also indebted to Mr. Walker for a fossil of the Guelph (a Megalamus Canadenses), which retains a portion of the original shell (hitherto we had only internal casts of it.) The characteristic *Rhizopod of the Coal Measures (Fusilina Cylindrica), exclusively confined to the Carboniferous Age, and, as such, useful in determining the true position of these Palæozoic rocks. This, kindly presented to us by Mr. Walker, has been temporarily placed in the Devonian case until the council furnishes another badly required for its proper formation

In conclusion, I have to submit, for the consideration of the Section, a communication from the Chief Palæontologist of the United States Geological Survey, Professor C. D. Walcott, enquiring if specimens of our local graptolites could be obtained for the Museum at Washington; and from Dr. Gunney, who intends publishing a work on the Niagara Graptolites. In forwarding a few from my own collection, I mentioned I thought the Hamilton Association could spare some from the side cases in exchange for other specimens from more recent rocks which we do not possess at present. I presume the Professor is now away from the office, as I have not heard from him since.

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*This Rhizopod, I am informed, has not, strange to say, as yet been detected in the English Coal Measures.

NOTES ON LOCAL FOSSILS IN THE GLACIATED CHERT NIAGARA BEDS.

Read before the Geological Section of the Hamilton Association, November 24th, 1893.

BY COL. C. C. GRANT.

The small attendance at our Sectional Meetings is exceedingly depressing to all who take an interest in the advancement of scientific research here. The reason of this non attendance is unquestionably a matter for enquiry. I understand it is attributed by some to our using technicalities, Latin names which are incomprehensible to some without having the equivalents in English. Of course you all know this is unavoidable, as our fossils in general have no English names. On the other hand our papers may be severely criticized by scientific exchanges, when we attempt to meet the public requirement, for not entering more fully into details and descriptions, more especially when such is absolutely necessary to enable our readers to form an idea of any new or rare specimens. Dry details of the kind indicated may be welcome to a few, but certainly not to many.

We must endeavour to interest the rising generation in our pursuits. This I look upon as a matter of supreme importance, and I am glad to see many of the youth of the city are already beginning to acquire small collections of fossils and to express a wish to have them named, and are desirous to learn all about them. One of the boys recently explained to me they found it hard work to pass the examinations; that they had little time for recreation, and Saturday, when the museum is opened, is the only day in which they can enjoy a good game of baseball or cricket. This explanation may probably be considered sufficient to account for the absence, in some instances, of by no means an inconsiderable portion of the community. Well, despite all that, the fact is, several intelligent lads in the city and neighbourhood are really interested in things which have little attraction for the same class in European countries—Natural

History, "Neglected in Irish schools do you say!" was the indignant remark of the Principal of a diocesan establishment. "Is not Goldsmith's Animated Nature sufficient for all our requirements in that direction?" The writer refrained from reminding the worthy domine of the sarcastic comment of Dr. S. Johnson; "Goldy's work on this subject! Why, I doubt if he knows the difference between a horse and a cow, and, if he does, 'tis the extent of his knowledge."

I have obtained for the side trays during the past few months a large number of fossils from the glaciated chert beds (the richest of all our local rocks in organic remains). From a single field, close to the Corporation drain, came nearly all the flint-flake specimens we see in our side trays, together with duplicates transmitted to Europe and elsewhere. One would imagine after so many years researches (over a fourth of a century) by your Chairman and Mr. A. E. Walker that not a vestige of a fossil remained in that limited space to repay the collector. But the swampy portion this year has been planted with Indian corn, and when that was removed the surface presented an unusual number of flint-flakes—more than ever previously noticed. The time for collecting was very limited; shortly after the crop was stacked it was removed and the field ploughed over. There is now no chance of obtaining specimens from it until next spring, when the frost, snow and rain have brought the buried flakes again to the surface.

These glaciated Niagara beds (eight feet in thickness) are well displayed at the rock cutting on the railway east of the Reservoir. It was from this locality I obtained the sponges and sponge sections *in situ*. I noticed they were chiefly confined to the upper layers, that the surface soil overlying was exceedingly thin in places, and I concluded it was probable before the soil was deposited, as the limestone was a softer and less durable material than the chert, I might find withered out specimens in the ploughed fields on the escarpment. The opinion I arrived at was subsequently confirmed. I filled my pockets with well preserved sections and sponges in the first one I examined. I was informed by the proprietor that several years before the ground there had been cleared of the second growth of forest timber. Within the last few years the clearing has been extended a few hundred yards east of it and the ground recently ploughed, but the sponges evidently require a certain time for ex-

posure in order to weather out. The lumps of half decayed chert are there, but the outer edge of the sponge within does not yet make an appearance, and the sections are rarely perceptable.

The upper glaciated chert beds hold great numbers of fossils, which doubtlessly come under the head "Cladopora" (Hall). Prof. Foorde (British Museum) expresses his opinion that it belongs to the Monticuliporidæ. If difference in form is deemed sufficient to constitute new species, there are here several as yet undescribed.

The fibrous structure of Monticuliporidæ or Chetætes is very clearly displayed, but one in my possession presents an undoubted straited Epitheca, which leads me to suppose its true classification may be with the Polyzoa. The Fenestellidæ are also well represented in these upper chert beds. The majority I have seen figured are mere fragments Now, here the radix or base presents itself, and they widely differ in many instances; some like certain forms of the Graptolites are cup-shaped, others display a fan-like appearance, the stem proceeding from spreading rootlets. They are also often beautifully preserved.

It is much to be regretted that the swampy places near the Corporation drain, where Bryozoans are chiefly found, were unknown to Drs. Nicholson and Hinde when they visited Hamilton. It is about the last spot in which the geologist would ever dream of hunting for organic remains. The Professors made the Fenestellidæ a special study, and discovered several forms previously unknown in the Devonian rocks of Ontario. On this account, I regret no opportunity was afforded me to point out to them where Niagara Polyzoa were obtainable, and in far better preservation than any known to me extracted from the true limestones of the Niagaras used for building purposes.

But the Niagara sponges (mainly confined to these glaciated layers which disappeared on the brow of the Hamilton escarpment in The Great Ice Age), the Cladoporæ, the Bryozoans (so characteristic) by no means represent the entire organic remains of that portion of the layers deposited. Graptolites, differing from any figured or described by Dr. Spencer, have been noted in the deeply grooved and polished upper beds of the city quarries, and others adjacent. The Corporation drain swamp recently afforded me several interesting specimens of rare flint-flake fossils, viz.:

Cornulites Flexuosa, Cornolites Bella Striata and another (probably new) which unfortunately is imperfect. It bears a near resemblance to the Teutaculite, figured by Dr. Hall from the Waverly beds, Caleolus Herzire. In addition to Crania Anna, already figured and described in the Niagara fossils of Dr. Spencer, I succeeded in securing the limpet-like dorsal valves of two other species, one of which may be Crania Siluriana, as it comes very near the description given ; the other differs from any known to me.

The Ariculedæ, or Wing Shells, are also represented in the upper portion as well as the base of the chert beds. I forwarded to a well-known English Palæontologist some years ago a flint-flake containing an Aricula, naming it A. Emacerata. He appeared to doubt its precise agreement with the European specimen known by the name. Indeed, I inferred from his subsequent letter that he was rather inclined to look on ours as an American variety.

Three species of Acidaspis put in an appearance in the chert beds, only one of which, I think, has been described "A. Halli" (Spencer).

I do not recollect ever seeing in any geological work a notice of the terminal Moraines along the Burton and Glanford stone road. One between the turnpike and school house could scarcely have escaped observation. It looks like an artificial mound such as we read of as occuring in the States. A few years ago a farmer opened a drain along the base, and exposed quite sufficient to satisfy me the great mass of boulders, sand and clay had been deposited by a retreating glacier. What! Fresh water ice drop such a load as you see there?

In the President's annual address, published in one of our exchanges (Bulletin Natural History Society of New Brunswick, No. XI), Prof G F. Matthews, alluding to modern faunas of oceanic tracts, points out: "We see in contrast two groups of animals—those that inhabit the warm shallow seas and those that may be found in the deeper and colder parts of the ocean. As there are now tracts occupied by waters of different temperatures, so there were in the earliest Palæozoic times, and this is shown by the remains of marine animals entombed in the rocks. In certain regions

are found remains of Coral building forms and Molluses, which correspond to those of the warm and shallow seas of the present day; and in other regions, as in the confines of this city and at various points in the Maritime Provinces, are entombed the remains of animals corresponding to the *Sertularians* (Graptolites), *Pteropods*, *Glass Sponges* and other forms of the open ocean."

I infer from the foregoing extract that Professor Matthews entertains a view, held by many Palæontologists even now, that the Graptolites (Ancient Sertularians) were confined to shale beds and indicated deep sea bottom. He may not be aware that this class of organic remains has numerous representatives in the Niagara limestones of Ontario associated with Pteropods (Conularias, four or five species), Glass Sponges (many undescribed as yet), Bryozoans, Brachiopods, Fucoids and Corals. Certainly the two latter were not likely to live in water of any very considerable depth, and if we assume that the Archaeans of this continent acted as a barrier and protected the Mediterranean Sea from cold Arctic currents, it seems difficult to explain where such could find an entrance at all, save, as the Atlantic does now through the gut of Gibraltar, in an undertow. It must be admitted that several Graptolites occur in the Niagara shales, but they are found in the limestones below as well as in the blue building beds above this material. Indeed, several of the layers bear a striking resemblance to some modern Coral Reefs, especially the ones called by quarrymen "The Sand Beds." Why so called I am unable to say; it may be because they are not unlike certain of the Medina freestones in color. It is an exceedingly difficult manner to determine the depth of the Palæozoic Seas from the Brachiopods embedded in the rocks. These constitute a considerable majority of the shells found fossilized in these rocks, and the species still existing appear to feel as much at home in deep as in shallow warm water.

Again, taking the Trilobites for instance, we all know how very numerous the head and tail shields of the Crustacean are in our local limestones. They may have drifted shoreward from deep water after decay. Single valves of *Lingulella* occur in great abundance, but we rarely find the complete shell, and only occasionally can we ascertain if it has been fossilized in its burrow. Fucoid sea plants afford us more reliable indications regarding the laws of distribution,

and we may reasonably infer that the Laminarian Zone of olden times did not materially differ from the one of the present day. Bryozoan (Polyozoa) so abundant in the chert band of the Niagara Escarpment here, cannot be looked upon as safe guides in deducing geological conclusions regarding the depth of primeval seas. The modern Sea Mats, Mooses and "Mermaids Lace Work" are world-wide, inhabiting alike Arctic and tropical waters, attached to the floating Gulf weed (*Sargassum*) and to the dense sea forests that annually spring up about Norfolk Bay and the shores of the North Pacific. Indeed, fossil plants, Algæ or Fucoids, are not certain indicators on this point either unless undoubted evidence can be obtained that sea currents had not transported the broken sea weeds from a distant place. The Laminarian Zone is supposed to extend from low water to about fifteen or sixteen fathoms, but banks, etc., may occur a considerable distance from land and there the plants would flourish, no doubt, yet they are liable to be torn away from their anchorage in heavy gales and carried seaward, not shoreward.

THE CHITON (MODERN COAT OF MAIL SHELL).

I was recently asked when the above named shell first put in an appearance in a fossilized state. The late Professor Billings claimed he discovered a specimen in the Black River Series Cambro, Sil. He named it "*Chiton Canadensis.*"

Another was described by the late Dr. Salter, Palæontologist of the Geological Survey of Great Britain and Ireland. It came from the Coal Measures, Europe, and was named *Chiton Carbonarius.* The former I have not seen figured or described, but little doubt can be entertained regarding the correct classification of the latter. We may see how very imperfect the geological Record must be when no specimens have been found in the intervening beds. The Devonian formation alone is nearly three miles in thickness. *Dentatium*, commonly called the Tusk Shell, is another Mollusc, which apparently survived from Palæozoic times.

ANADONTA—UNIONIDÆ.

In "Characteristic British Fossils," of the late Professor W. H. Baily of Dublin, you will find figured the oldest fresh water bivalve I think yet discovered. It occurs in the upper part of the old red

sandstone—that portion of the Devonian formation supposed to be chiefly of laenstrine origin. Externally it bears a remarkable resemblance to to the Unionidæ of our lakes and rivers, known better here as *Clams*. I do not know whether it presented the usual nacreous lustre of the family or whether it had been submitted to microscopical examination by the late Dr. Carpenter. Perhaps not; for Woodward in a note, "Manual of the Mollusca," page 213, remarks: "The fossil shells of the older rocks are so generally pseudomorphous or partake of the metamorphic character of the rock itself, that it is difficult to obtain specimens in a state for microscopic examination."

Here a strange coincidence occurred. On putting aside my notes, I received a package directed from Ottawa. On removing the outer cover, I found "Notes on the discovery of large Unio-like shells in the Coal Measures, South Joggins, N. S ," by J. F. Whiteaves. Doubts may be entertained regarding the true affinity of the Irish specimens, but taking into account that the Nova Scotia shell was associated with true land plants, (fragments of Sigillaria, Cordaites) and that a portion of the test of a bivalve (Nacreous throughout) was found in the same bed, few can doubt but Professor Whiteaves' conclusions are pretty accurate (despite absence of the hinge dentition) viz., that it represents an aberrant and extinct type of the *Unionidæ*.

THE ARK SHELL.

Another modern Lamellibranch, named above, had a representative in the Palæozoic age, the *Ctenodonta*, of Salter. The hinge line displayed a double row of teeth, bent, connected by smaller ones below the beak. This peculiarly was unknown to Dr. Jas. Hall, and, from its external appearance solely, he had previously named the fossil *Tellinomya*, as its shape suggested a certain relationship to the *Tellins* and *Myas*. Hall's name apparently holds its original place in the States. Dana figures *T. Nasuta* H., Trenton, at page 200 in his manual (revised edition), and also gives the teeth, which clearly shows that it belongs to the family *Arcacidæ*. The *Isoarca*, of Count Munstus, 1842, antedates both names, and Woodward, in the manual of the Mallusca, includes Salter's Ctenodonta under the head.

"The ark shells of the Palæozoic strata," he remarks, "have their anterior teeth more or less oblique like Arca, their posterior

ones parallel with the hinge as in Cucullæa." Leda, of the Leda clay, belongs to this family group. Nucula, another member of the family group, was also represented in Palæozoic times.

TRIGONIA.

In Australia the sole survivor of its race, *Trigonia Pectinata*, a beautiful nacreous shell (interior purple or gold) may be obtained in Sydney Harbour. Woodward figures Trigonia Costata from the British Oolites, giving the general range of the Genera from the trias to the chalk, remarking, 'not known in Tertiarus.' Silicified casts of Trigonia are found at Tisbury, preserving even the animal itself with the gills complete. It is said there are three species, but they are probably varieties only. In a paper I received from the late J. Beete Jukes, I find the following: "When acting as Naturalist in H. M. S. Fly, 1845, I came upon nests of Brachiopods under rocks (Waldheimia Australia). They varied so much in size, shape, etc, that McLeay proposed to make three species out of my first find. As they occured in family groups—parents and children, uncles, aunts and cousins—I doubted the specific distinction. After collecting some hundreds, it was plainly perceptable that variation in size and in external marking from smooth to deep ribbing graduated into each other, and there was no definite distinction."

I think there must be some mistake regarding the first appearance of the fossil *Trigonia*. *Lirodes ma post striata* is mentioned by Dr. Spencer as accuring at Burlington Heights in Cambro-Silurian pebbles. I gave him one of three specimens obtained there, and unless we exclude external appearance altogether, it surely must be considered a member of the Trigonidæ.

THE CYPRINIDÆ.

Representing a genera of shells formerly numerous—are also on the wane. The modern Heart Cockle, *Esocardia Cor.*, British Seas and *Astarte Sulcata* are examples. Megaladons "Megalomus Canadensis, Hale," are said to belong to this group.

ARICULIDÆ.

The Ariculidæ or Wing-Shells, to which the famous pearl oysters of Ceylon belong, and perhaps the Prima also (although I may add Tryon and other Conchologists consider this latter is

entitled to a distinct family classification,) were undoubtedly represented in Palæozoic times by Molluscs bearing at least externally, I cannot say a close, but certainly a resemblance to the shells of tropical or sub tropical seas of our own days. *Pterinea Demissa* and *Ambonychia Radiata*, so frequently found in Cambro-Silurian drift pebbles and shingles, here are supposed to come under this head, as as also *Fosidonomya*, *Posidonia* and two or more specimens from the Barton Niagaras. *Solemya*, a shell yet living in the Mediterranean, also dates from Palæozoic times.

PECTEN, SCALLOP OR COMB-SHELL.

Nearly related to the foregoing, although included among the Ostracidae by Woodward in "The Manual of the Mollusca," are the Scallops. Three species occur in the lower Carboniferous of Ireland now known by the name of Aricula pecten, McCoy. One, *A. Sowerbii*, still retains its wavy zig-zag bands of amber color in the mountain limestone beds. I had not the good fortune to collect a single example of this beautiful and very rare fossil, although I succeeded in securing many of the characteristic ones figured in the late Professor W. H. Baily's work. A quarry near Templemore, Tipperary, afforded me some of the best preserved organic remains such as limestones seldom yield. I never possessed, I believe, even average skill in extracting such things from the matrix. But then, owing to the soft nature of some of the layers, I found little difficulty in obtaining almost perfect casts of well known Palæozoic shells, with one exception, Orthoceras. The modern *Naticas* and *Pyramydellidæ* were also represented by species in the mountain limestone of Cork and Limerick, the latter by a *Loxonema*. *Pleurotomaria* occurs in the carboniferous rocks and *Nautilus Dorsalis*, Phillips. The last, however, I did not get. No doubt I may have omitted other families that can be traced to Plæozoic times.

Independent of a few shells, whose position is yet unsettled, the Echinus or Sea Urchin was represented by *Palæchinus Elegans*, McCoy. I did not obtain even a spine in the quarries I examined.

BRACHIOPODS.

While I feel I am reversing the order of their appearance, this necessarily follows in the course we take in any attempt to link the

present with past ages, and however imperfect the record may be, and however difficult to comprehend the changes which have taken place underlying all, one may perceive that the accepted beliefs of former generations have lost, or are losing, their hold, not only on leading scripture men, but on the public as well. From the strange relationship this class of the Mollusc bears, not only to the higher Lamellibranchs, but to Annelids, Tunicates and Polyzoa, it naturally attracted considerable attention of late years. The researches may not have led to all that was expected, but they have yielded much important information already, and will pave the way for future investigation. So far back as 1834, Von Buch asserted that the classification of the Brachiopods ought to be determined by the nature of the pedicle opening. The general external features, however, continued the essential basis up to 1848, but about that time King pointed out the interior of the shell afforded more reliable data. This view, with additions of his own, was adopted by Davidson, and modifications were subsequently proposed by others. It is now claimed that the results of the studies of fossil forms combined with that of living species have led to the recognition and establishment of certain primary characters resulting in the discovery of an original structure now applied to a more correct classification. According to Professor Sheuchert, whose words I quote, Drs. Beecher and Clarke, Hyatt, Morse, Sheply and Brooks deserve great credit for their respective discoveries. Thus the views of Von Buch are now accepted. Better late than never.

It has been ascertained that Lingula passes through two stages *Paterina* and *Obolella*, consequently it is no longer considered the prototype of its class, Paterina being the most primitive genius known, being found in lower Cambrian. Indeed it appears to be considered the ancester of all Bracheopods. Forty-seven families or sub-families are recognized. Six still living are represented as Plæozoic survivors, including *Thecidium*, a Mediterranean *Terebratula* recently traced back from the Trias fossils. But the specimen I have never seen, and do not altogether understand the grounds of separation. Professor Whiteaves, the Palæontologist of our Dominion Survey, is exceedingly cautious in reminding us not to forget Dr. Woodward's remarks which he incorporates in his own description, viz , "That the Molluscan Genera of the older of the newly discovered shell

rocks are believed to be nearly all extinct; and though the names of many recent forms appear in catalogues of Palæozoic fossils, it must be understood they are only employed in default of more exact information." The unio-like Devonian Irish shell, unlike King's Anthracosia, is invariably associated with land plants.

DISCOVERY OF COLORED LINGULÆ IN CAMBRO-SILURIAN ROCKS, HAMILTON, ONT.

The oldest colored shells yet discovered are three distinct species of Lingulæ, *Lingula oblonga*, *L. oblata*, *L. perorata*, from the Clinton Silurian beds of Hamilton; colors, blue, pink and brown The Chairman submitted for inspection a still older specimen from Burlington Heights, obtained from a drift boulder containing also two characteristic Trenton fossils, *Rhinchonella Plena*, and another which is also found in the Hudson River series. A Nacreous Gasteropod was some years ago discovered by the Rev. A. Carmichael at this locality in Cambro-Silurian shingles.

NOTE.—I confess I am unable to see why the Limpets (*Patelledæ*, *Calyptrœidæ*) should not be included among the Mollusca which appeared in Palæozoic times. The *Metoptoma Estella* (Billings) from English Head, Anticosti, seems to be a true *Bonnet Limpet*. The brittle stars, that possess the property of dissolving their Corporations at will, were represented at the time in question by *Protaster*.

NOTES FROM OUR EXCHANGES—GEOLOGICAL AND ANTIQUARIAN.

BY COL. C. C. GRANT.

Read before the Hamilton Association, March 30th, 1894.

In the middle division of the Upper Laurentian, below the St. John's group (base Cambrian rocks), a very important discovery has been recently made by Professor G. Matthews, M. A., New Brunswick. He claims to have extracted low organisms, sponges, spicules, and stomatoporid forms in this series at St. John's. The latter is a calcareous column encircled by siliceous matter in which the wavy lines are considerably arched. He thinks it more closely allied to *Cryptozoon Proliferum Hall* (calciferous) than to *Eozoon Canadense.* You may recollect I submitted for your inspection a few years ago a Cryptozoon I obtained near the Corporation Drain, which was derived originally from "Lime Ridge." My specimen bore such a marked resemblance to the one figured in "The New York State Survey" that I forwarded the fossil, and Dr. Jas. Hall's figure of the calciferous one to Sir W. Dawson, as I was unable to perceive any marked difference between them.

The Rosette-like concentric form I fail to recognize in Professor Matthews' problematical fossil, *Archæozoon Acadiense.* Yet I believe it represents a low organism—a jelly-like mass of Protoplasm, not widely differing from the Amabæ, still existing. The sponge spicules the Professor claims to have discovered in "the Plumbago bed" and "Graphite" itself may be questioned, and it certainly is difficult to understand how on earth sponges came there if the late Sterry Hunt's views regarding the origin of Plumbago are accepted.

But this cannot be said of the fossil named and figured in "the Bulletin, No. IX., Natural History Society of New Brunswick," *Cyathospongia Eozoica.* The Quartzite specimen from the Laurentians bears so close a resemblance to the Cambrian sponge—*Photospongia fenestrata Salter*—that its nature can hardly be doubted; it merely differs in the *size* of the spicules. One of the principal

objections regarding the animal nature of *Eozoon* was that no other well defined fossils have ever been found in Archæan rocks, and Sir W. Dawson must be highly pleased at this recent discovery. How can his opponents, with any show of reason, explain away the additional evidence now forthcoming? They can hardly accept Salter's sponge and reject Matthews'. Hitherto no unquestioned or well defined organic remains have been found so low down in the earth's crust; yet indications of such have been remarked by several. I forwarded to an English friend, some years ago, fragments of Drift Laurentian and Huronian boulders from Hamilton. He mentioned that prepared sections of some of the specimens under the microscope revealed, as he considered, organic matter. The chief Palaeontologist of the United States, C. D. Walcott, found in the Laurentians fragments of what he supposed to be a *Trilobite* and a phosphatic shell. We can hardly expect to find many organic remains in rocks which have been crystallized *Quartzites* or *Granites*, although research or accident may yet reveal such in *the limestones* of the formation.

"In truth," remarks the Director of the Geological Survey of Great Britain and Ireland, "we are profoundly ignorant as to the conditions under which these Archæan rocks arose. Is their apparent bedding original or the result of after disturbance? The question cannot be answered." One thing seems clear. If, as the late Sterry Hunt contends, the Archæan rocks are probably altered sedimentary deposits, they must have been derived from still older ones than any known to us, which disappeared completely in some far off revolutionary change the world has undergone.

We are indebted already to Professor G. Matthews for the discovery of the Arcadian or St. John's Group (2,000 feet Lower Cambrian). When the Potsdam sandstone was found resting on Archæan rocks, it was natural to suppose it was the base of the system, but it represented merely the rim of the depression or basin (the New Brunswick beds underlying).

A certain unwillingness may be noticed, both on this continent and in Europe, among a few of the older Geologists to recognize the Cambrians of Sedgwick as separable from the Lower Silurians. Now, C. D. Walcott, chief Palaeontologist of the United States Survey, who has closely studied the Cambrians all over the conti-

nent, emphatically asserts that it is as well defined a formation as the Devonian or any other.

MOUND-BUILDERS AND INDIAN RELICS.

The systematic exploration of the Mound-builders' remains, by the United States Survey, has led to the conclusion that they were erected by the ancestors of the Red Man. This decision is undoubtedly satisfactory to Professor Lapham and a few of us who shared his views. It is amusing to reflect how slowly light dawned on this long debated matter. Dr. S. Peet, the editor of *The American Antiquarian*, Chicago, in an early paper, considers it absurd to suppose that the Indians—for instance, Dakotas, Cherokees, etc.,—were the Mound-builders, or that they were descended from them. Then later on follows the true conclusion, obtained apparently from more reliable data, that the Mound-builders were changed to the Indian merely by contact with the white man. Here we have no attempt to minimize the original mistake.

The Burial Mounds in the Northwest Territory, near Rainy River, appear to be more ancient than many opened in the United States. Mr. D. Young made a cutting into the one in which Dr. Bryce had previously obtained an earthenware vase. He found, it is said, the form of a man in a sitting position, with face towards the east, pieces of pottery beside him, as well as a large granite spear-head. The Winnipeg *Free Press* adds that Mr. Crowe also opened a trench in this Mound, in which was found a body in a like position, encased in birch bark. Unfortunately it was not stated whether the incision was made through the summit or not, and the United States explorers inform us that it is quite a common custom still for tribes of the Aborigines to inter their dead in such places.

A smaller Mound contained a skull and bones, with two vases, all of which fell in pieces when touched. Professor A. Lawson, an officer of the Canadian Geological Survey, found some copper beads and vessels, with three vases like the first one found by Mr. Bryce. Unfortunately the writer does not state whether the former was of native or "white men's" manufacture. I have seen a vase from an ossuary at the Beach which had been roughly hammered out of a sheet of Lake Superior copper. The same cemetery also contained

glass beads and other ornaments, undoubtedly obtained from Europeans.

Some Indian relics from Ontario were submitted for examination to an Irish Antiquarian several years ago. To my friend's surprise he stated that nearly all the so-called "Indian Wampum" was made by the whites, as also the more highly finished stone implements. The early adventurers and traders noticed the great value attached to these articles by "the Red Men," due perhaps to the difficulty of procuring a suitable sea shell and the tedious processes pursued in finishing. The Aborigines formed the shell money by breaking up the material into fragments and rounding these on heated stone But "the whites" turned out such immense quantities by machinery that the Red Men ultimately purchased it by strings six feet long.

The Ossuaries opened in this portion of Ontario cannot be very ancient. As far as I can learn they all, like the ones at Lake Medad and the Beach, contained ornaments and utensils made by white people. We can produce no proof that man has existed for any long period at least in this part of the continent. However, wandering hunters, living chiefly by the chase, were not likely to leave behind them many permanent records of their existence. Had undoubted implements of human make been found *in* the undisturbed gravel, etc., of Burlington Heights (the old Lake Ontario Beach), it would merely take us back to a time subsequent to the withdrawal of the great glacial ice sheet, for you may remark the Tile underlies it.

The United States Geological Survey and its able chief, Mayor Powell, are deserving of the highest praise for the thorough investigation of the Mounds all over the United States, and their contents. They certainly are entitled to very great credit for clearing up the mystery regarding the copper marks and ornaments so frequently discovered in burial places in the South. "They are ceremonial ornaments of various designs," remarks the Director of the States Survey. "I had several of them mounted on glass, and on studying them with a powerful magnifier I ascertained that they were made by *machinery* and struck with *dies*." Here we have what we may consider a truly original discovery. It is also satisfactory to find additional confirmation that the Mound-builders of Florida and the

South interred their dead in precisely the same way as in the North-west Territory. Mayor Powell's Report is undoubtedly a valuable contribution to American Anthropology, but the Washington authorities simply produce additional proof in support of views which a few of us in Canada and the United States expressed many years ago.

The sea shells—*Mactra Solidissima* or *Callista Gigantea*—contributed to form "shell money" as well as *Fulgar Carica* and *Venus Mercenaria.* Wampum made from the river mussell—*Unio,*—as I have remarked, has been found in New Brunswick. Dr. Bryce, of Manitoba, is one of the few Professors in this Dominion who take much interest in Antiquarian matters. He, I believe, expresses the erroneous opinion that the Mound-builders were a distinct race which had been wiped out of existence by the Indians. Perhaps, if he should ever pay us a visit, I may suggest that he ought to examine the very interesting collections of Mound implements and other relics in possession of Mrs. Carey and Mills, of Hamilton, and compare them with the valuable one at Toronto belonging to the Canadian Institute. If, after a careful comparison of these, his views are not considerably changed, I shall feel greatly surprised. No doubt, in some instances, the implements obtained from the Mounds are superior to the ordinary ones we picked up in ploughed fields, but all are similar as regards design, and, indeed, the superiority is frequently in the other direction.

REPORT OF THE CURATOR.

Donations to the Hamilton Association during the year 1893-4.

A specimen from Nanaimo of the Sea Worm Teredo Navalis, with a piece of A. Douglas' pine pile destroyed by the same.—Donated by E. M. Land.

Three petrified fish, of the Eosene period —By Mrs. C. Lock

A fine skin of the Horned Owl, and five other birds.—By Mrs. H. McLaren.

A Boomerang, from Australia—By Mr. G. Taylor.

Stone Chisel, from New Zealand.—By Mr. W. Flitcraft.

The jaw of an Elephant Fish, from Bay of Bengal.—By J. S. Grieves.

Small coin (medal) made of pure aluminum.—By ————

Beetles and Butterflies, from British Guiana.—By Mr. McIlwraith.

A Sword, picked up from the battle field of Preston Pans, fought on the 19th September, 1745.—Donated by Mr. Reid, of Hamilton, whose grandfather found the same.

One of the Silver Medals granted to the Six Nation Indians who served in the wars of 1812.—Loaned by Mr. C. Sewall.

Copy of "The Times" (newspaper) dated London, 1792, containing an account of Nelson's victory of the Nile.—Donated by Mr. B. E. Charlton.

A Venus' Basket and Shells.—By Col. C. Grant.

A six pound Cannon-ball, from Navy Island.—By Mr. Haskins.

A stuffed English Cuckoo.—By Mrs. Littlehales.

A valuable collection of Geological specimens.—D. E. Roberts.

The Association has also received a very valuable collection of the ferns of Arizona and New Mexico, and the sea-weeds of the Pacific, from the late Pro. Wright. These have arrived too late for the publication of a classified list, which will appear in the next Journal of Proceedings.

A number of Fossil Sponges have been cut and polished (and placed in the case) under the direction of Col. C. Grant and Mr. Walker, of Hamilton.

The Museum has been kept open every Saturday afternoon during the winter, and very much appreciated judging from the number of visitors. A large number of Fossils have been added to the collection by Col. C. Grant and other friends.

ALEX. GAVILLER,

May, 1894. *Curator.*

REPORT OF THE PHOTOGRAPHIC SECTION.

Read at the Annual Meeting, May 10th, 1894.

In presenting this Report we feel pleased to think of the advancement that has been made by this section over last year.

During the summer very little was done at the regular meetings outside of the general business.

In the month of August Mr. John Eastwood announced that he would give two prizes for the best set of three slides made from the work of 1893. The prizes have since been won by Mr. Baker and Mr. Lees in the order named. At that same meeting Mr. A. M. Cunningham kindly donated an album to contain the work of 1892 and 1893, as a record of the Club's advancement. At the same meeting it was arranged that Mr. Cunningham should give a lesson in Development. When the general business was finished the meeting adjourned to the dark room to witness the demonstration in development. Your Secretary regrets that so few of the members were present, as a lesson was gained that not one member should have missed. The thanks of the Section are due Mr. Cunningham for the great interest he has taken in this work, and I am sure we all appreciate his efforts and are grateful to him for his kindness in imparting information to the members.

During the month of November several of our members sent in a number of views to the *Canadian Photographic Journal* competition. The result was very gratifying, Mr. Baker and Mr. Lees being successful in having their names placed on the honor roll.

On November 17th, 1893, a special meeting of the Section was held to arrange for an exhibition of World's Fair slides, loaned by the Toronto Camera Club, to be held on Thanksgiving Day, Nov. 23rd, 1893. The success of this exhibition you are all aware of.

At the meeting held January 9th, 1894, it was, on motion of Mr. Grant, decided that a special meeting be held on the second Tuesday of February, March and April, when any business of a special nature could be taken up and general discussions on Photo-

graphy held. These meetings have been of great benefit to a large number of members.

In the month of February this Club sent a number of prints and slides for competition to the exhibition of the Toronto Camera Club. The pictures were highly spoken of by the *Photographic Journal*, and our esteemed Chairman captured the bronze medal for his view of Mr. Copp's house, in the Architectural class.

On the 13th and 14th of March a very interesting exhibit of photographs was held in the museum of our Association by this Section, and it was agreed by all who availed themselves of the opportunity of viewing the collection that it was, without exception, the finest collection of amateur phothgraphs ever gotten together. In a letter I received from Clarence B. Moore, he informs me that one of his pictures had been hung in the Salon at Paris and another in the Salon at London, England. This is proof that photography is rapidly coming to the front among the fine arts. Apart from our own entertainments, the Club has provided two evenings for the Association. The first evening was the display of pictures made at the opening meeting of the Association ; the other one the lantern night, which was held on the evening of March 8th. Both of the evenings were very successful and were highly appreciated by the officers, members and friends of the Associaton.

I cannot close this Report without thanking all who have in any way aided in making our entertainments and general meetings so successful, and especially to our esteemed chairman, Mr. Briggs, who has been so constant in his attendance at our meetings. And I hope that although he retires to-night from the chair, he will not lose any of his enthusiasm and interest in the Section.

All of which is respectfully submitted.

WILLIAM WHITE,
Secretary.

HAMILTON ASSOCIATION.

Statement of Receipts and Disbursements for the Year ending May 11th, 1894.

INCOME.

Cash balance from 1893	$160 57
Government grant	400 00
Sale 1, Birds of Ontario	1 00
Interest on deposit	20 00
Members' subscriptions	122 00
	$703 57

EXPENDITURE.

Rent	$206 50
Subscription to publication	9 50
Printing notices, stationery and postage	68 70
Caretaker	42 00
Insurance, repairs, gas, and sundry expenses	54 73
Times Printing Co., for Annual Report	189 71
Balance on hand	132 43
	$703 57

THOMAS MORRIS, JR.,
Treasurer.

I have examined the vouchers and found them correct.

H. P. BONNEY,
Auditor.

May 10th, 1894.

THE JOURNAL AND PROCEEDINGS OF THE HAMILTON ASSOCIATION

IS SENT TO THE FOLLOWING:

I.—AMERICA.

(1) CANADA.

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

(2) UNITED STATES.

Kansas Academy of Science.....Topeka, Kan.
Kansas University Quarterly.....Lawrence, Kan.

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

Society of Alaskan Natural History and Ethnology, Sitka, Alaska.
Agricultural College ..... Lansing, Mich.
Colorado Scientific Society ..... Denver, Col.
Museum of Natural History ..... Albany, N. Y.
Rochester Academy of Sciences ..... Rochester, N. Y.

(3) WEST INDIES.

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

(4) SOUTH AMERICA.

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

II.—EUROPE.

(1) GREAT BRITAIN AND IRELAND.

England.

Bristol Naturalists' Club ..... Bristol.
Literary and Philosophical Society of Leeds .... Leeds.
Conchological Society ..... "
Royal Society ..... London.
Royal Colonial Institute ..... "
Society of Science, Literature and Art ..... "
Geological Society ..... "
Manchester Geological Society ..... Manchester.
Mining Association and Institute of Cornwall.

Scotland.

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

Ireland

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

(2) AUSTRIA-HUNGARY.

Anthropologische Gesellschaft ..... Vienna.
K. K. Geologische Reichsanstalt ..... "

(3) BELGIUM.

Société Géologique de Belgique.....Léige.

(4) DENMARK.

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

(5) FRANCE.

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

(6) GERMANY.

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

(7) RUSSIA.

Comité Géologique.....St. Petersburg.

III.—ASIA.

(1) INDIA.

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

(2) STRAITS SETTLEMENT.

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

(3) JAPAN.

Asiatic Society of Japan .....Tokyo.

IV.—AFRICA.

(1) CAPE COLONY.

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

V.—AUSTRALASIA.

(1) AUSTRALIA.

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

(2) NEW ZEALAND.

New Zealand Institute.....Wellington.

(3) TASMANIA.

Royal Society of Tasmania.....Hobartown.

Obituary.

THE LATE DR. JOHN RAE, LL.D., F. R. S., F. R. G. S.

Dr. Rae was First Vice-President of our Association when it was established in 1837, and in the following year he was President. His name has been in the list of our honorary members for several years, and we have always considered it a great honor to have had such a famous man connected with our Association in the foregoing capacities.

Born in the year 1813, in the Orkney Islands, in the north of Scotland, he was therefore in his 80th year at his death, which took place on the 13th of July, 1894, in London, England.

He studied medicine at Edinburgh, taking his degree in 1833, and entered the service of the Hudson Bay Company in the same year. In 1846 he set out on his first voyage on behalf of the same Company, and so successfully was this accomplished that he was offered and accepted the place of second in command of the expedition under Sir John Richardson, to search for Franklin. This expedition was unsuccessful, but in 1849 Dr. Rae was appointed to command another search party to the Arctic coast. In order to utilize the time before navigation opened, he, accompanied by two men, made a journey along the shores of Wollaston Land, traversing over 1100 miles, he himself dragging the sledge. The average day's journey was about 25 miles, and the whole shore was minutely examined, including Victoria Strait, in which, as it afterwards appeared, Franklin's ships had been abandoned. Continuing the exploration, he and his party, with the aid of snow-shoes, marched continuously at the rate of 27 miles a day to Fort Garry, now the city of Winnipeg. In eight months they had travelled 5380 miles, 700 miles of which was newly discovered territory. For this he got the Gold Medal of the Royal Geographical Society. Again, in 1853, he took command of an expedition organized by

the Hudson Bay Company to trace the west cost of Boothia, and, from information obtained from the Esquimaux, he succeeded then in placing beyond all doubt the fact that Franklin and his men had perished from exposure and hunger. On this occasion he purchased from the natives a number of the relics of the ill-fated party. Returning to London in the early part of 1855, he found that he was entitled to £10,000, which the Government had offered for the first news of Franklin, a fact unknown to him while conducting the Expedition. It should be stated here that he shared this sum with his men, and again resumed his position in the Hudson's Bay service. This, however, he left as soon as his pension could be secured, and for some years he resided here and in Toronto. It was during this period that he was a member of this Association. In 1860 he married a daughter of Captain Thompson, of Toronto, who survives him. In the same year Dr. Rae took the land part of a survey of a contemplated telegraph line to America from Britain *via* the Faroe Islands and Iceland. Greenland was next visited, and in 1864 he took a leading part in a telegraph survey from Winnipeg across the prairies and through the Rocky Mountains. Subsequently some hundreds of miles of the dangerous parts of Fraser River were run down in small dug-out canoes without a guide, a most perilous undertaking, but successfully accomplished. He saw much in his time of unknown parts, covering some 1800 miles of previously unexplored ground. He settled permanently in London about 1866. His reports to the Royal Geographical Society are very valuable. He was a frequent and welcome attendant at the meetings of that Society, where his record of travel, his genial manner and graphic powers of description were often in request.

Our late honorary member, Dr. Rae, who has gone to his rest, was a grand old man. His name recalls the age of romance in Arctic exploration, when attempting to reach the North Pole or searching for the northern passage was a far more hazardous operation than it is to-day. For nearly half a century Rae's name had been connected with the moving tale of the long search for Sir John Franklin. It was to Rae that the English public were indebted for what they came to know of the fate of Franklin and his party.

Dr. Rae was a man of fine, resolute courage, of tender sympathy, of manly and heroic persistence. The modern world knew lit-

tle of him, but scientists honored him. He was a man of remarkable personality. As a man, he was simple, courageous, honest and true; he was of great stature and immense physical powers, as his age of four score, after many years of peril and privation in Arctic regions, testifies. He was buried in the church yard of Kirkwall Cathedral, in the Orkneys. So that all that was mortal of the Arctic hero rests among the people whom he loved, where the northern sea and the wild bird notes make the music that he loved.

Dr. Rae was also a Fellow of the Royal Society, and was greatly honored by many foreign scientific bodies.

REV. W. P. WRIGHT, M. A.

To many of the older members of the Association the subject of this notice was well and favorably known. No member connected with this Association from 1870 to 1882 was more constant in his attendance, and more earnest in his endeavors for its best interests, than the late Professor Wright. His genial disposition and kindness of heart made him much beloved by his fellow members.

During his connection with this Association he did much for it. He was for many years a member of the Council, and in 1881 was First Vice-president. He contributed many very interesting and valuable papers to the Association, all indicating an intense love of the beautiful in nature, and a habit of close observation of his modes of operation. Geology and Botany were his favorite pursuits—the latter especially so.

He was an industrious collector of specimens. His collection of Ferns and Algæ, now the property of the Association, donated through the kindness of Mrs. Griffith, of this city, will have a place in our Museum, and will be a beautiful reminder of his beautiful life and character, and bring to mind his cheery, happy face, as some of us remember it.

Mr. Wright was born at Pompey, Onondaga County, New York, in 1828. He came to Canada when 11 years of age, and graduated from Victoria University, Cobourg, in 1846, being only 18 years of age. He afterwards completed a Theological course of study in New England, and was called to Cobourg as Professor in 1850. In 1855, with Dr. Dempster and Professor Goodfellow, he laid the foundation of what is now the North Western University of Evans

ton, near Chicago. He taught for some time there, and then was for six years minister in the Rock River Conference. Returning in 1861 to Canada, he was called to the Chair of Natural Science in the Ladies' College in this city, filling it with great acceptability for 20 years, when he and his family moved to California. He died at Los Angeles on July 3rd, 1893, aged 65 years.

As a boy he was very bright and studious. He had a splendid memory; at 13 years of age his name was on the college register with names of young men almost twice as old, and his teacher at that time declared that he had already passed a course of long, hard classical study, with others so many years older than himself. As a minister he was instructive. He was a successful teacher, and made his class-room a very pleasant place.

He was witty, intelligent and very kind, and as has already been hinted, his face was the exponent of a spirit, whose life-purpose being cheerfulness, had indelibly written upon it a radiant hopefulness.

Previous to his death he had a long period of weary suffering; yet even up to the last he did not complain, and retained his characteristic courage.

LIST OF MEMBERS

OF THE

HAMILTON ASSOCIATION.

HONORARY.

1881 Grant, Lt.-Col. C. C., Hamilton.
1882 Macoun, John, H. A., Ottawa.
1885 Dawson, Sir Wm., F. R. S., F. G. S., F. R. C. S., Montreal.
1885 Fleming, Sanford, C. E , C. M. G., Ottawa.
1885 Farmer, William, C. E., New York.
1885 Ormiston, Rev. William, D. D., Gladstone, Los Angeles, Cal.
1865 Rae, John, M. D., F. R. G. S., LL. D., London, England.
1886 Small, H. B., Ottawa.
1886 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.

CORRESPONDING.

1871 Seath, John, M. A., Toronto.
1881 Clark, Chas. K., M. D., Kingston.
1881 VanWagner, Lieut -Col. P. S., Stony Creek.
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.
1892 Woolverton, L., M. A., Grimsby.

LIFE.

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

ORDINARY.

1892 Adam, Alex. E.
1882 Adam, Jas. R.
1881 Aldous, J. E. P., B. A.
1872 Alexander, A., F. S. Sc.
1892 Alexander, Ernest.
1891 Arthur, C. C., M. A.
1892 Baker, C. O.
1892 Baker, Alfred H.
1885 Baker, Hugh C.
1880 Ballard, W. H , M. A.
1880 Black, Geo.
1890 Bonney, H. P.
1881 Boustead, Wm.
1892 Bowman, J. W.
1881 Bowman, Wm.
1880 Briggs, Samuel.
1857 Brown, Adam
1891 Brown, O. J., M. A.
1885 Buchanan, W. W.
1892 Buckley, Miss M. A.
1792 Burkholder, J. G. Y.
1880 Burns, Rev. A., D. D., LL. D.
1894 Burns, Miss B.
1891 Burns, J. M.
1889 Campbell, D. J.
1894 Campbell, Robt.
1892 Cameron, Chas. E.
1890 Cape, John
1891 Carpenter, H., B. A.
1891 Chapman, J. R.
1891 Chapman, W.
1880 Charlton, B. E.
1891 Cheyne, John P., Commander R. N.
1884 Childs, W. A., M. A
1890 Clark, D., D. D. S.
1890 Cloke, J. G.
1887 Colquhoun, E. A.
1894 Crawford, G.
1891 Crawford, J. T., B. A.
1892 Crisp, Alf. C.
1880 Cummings, James
1892 Cuttriss, Geo. H.
1892 Davidson, Mrs. M.
1872 Dickson, George, M. A.
1880 Dillabough, E. H., M. D.
1892 Devine, A L.
1892 Dow, R. C.
1891 Eastwood, John M.
1892 Edgar, Robt. L.
1890 Elliott, W. H., Ph. B.
1881 Evans, J. DeV.
1891 Evans, W. Sanford
1891 Fearman, F. W.
1882 Ferres, James
1890 Finch, C. S.
1880 Findlay, W. F.
1880 Fletcher, Rev. D. H., DD.
1880 Forbes, A. F.
1891 Foster, F. G.
1880 Foster, W. C.
1892 Garrett, A. D.
1880 Gaviller, Alex.
1882 Gaviller, E. A., M. D.
1883 Gibson, Hon. J. M., M.A., LL. B.
1888 Grant, A. R.
1892 Grant, W. J.
1887 Greene, Joseph
1883 Grossman, Julius
1888 Galbraith, W. S.

1894 Hansel, F., D. D. S.
1882 Harris, W. J.
1892 Heming, A. H. H., O.S.A.
1887 Hobson, Thos.
1890 Holden, Mrs. J. Rose
1892 Holliday, John, M. A.
1891 Hore, J. C.
1887 Ireland, S. J.
1892 King, A., M. A.
1882 Laidlaw, Rev. R. J., D. D.
1890 Lancefield, R. T.
1884 Lee, Lyman, B. A.
1892 Lees, George
1890 Lees, Thomas
1857 Leggat, Matthew
1890 Leslie, Geo. M.
1880 Leslie, James, M. D.
1880 Littlehales, Thomas
1891 Lochead, L. T., M. A.
1887 Logie, W. A., B.A., LL. B.
1880 Lyle, Samuel, Rev., B. D.
1891 McClemont, Wm. M.
1894 McConnell, Miss L.
1891 McCullough, C. R.
1857 McIlwraith, Thos.
1890 McInnes, Hon. Donald
1884 McLaren, Henry Major
1890 McLaughlin, J. F., B. A.
1880 Macdonald, J. D., M. D.
1857 Malloch, A. E., M. D.
1891 Manning, A. E.
1890 Marshall, William
1886 Martin, Edward, Q. C.
1892 Mathesius, R. A.
1892 Mills, Edwin
1887 Mills, Geo. H.
1886 Milne, Alex.
1884 Mitchell, Wm.
1887 Mole, Wm., M. R. C. V. S.
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1890 Moore, Charles
1890 Moore, Henry E.
1892 Morgan, Arthur
1891 Morgan, S. A., B. A.
1886 Morgan, W. S.
1887 Morris, Thomas Jr.
1883 Murton, J. W.
1870 Mullin, John A., M. D.
1891 Myles, Wm. H.
1880 Neill, A. T.
1887 Nelligan, J. B.
Noyes, Mrs. Ed. F.
1892 Overell, M. J.
1885 Plant, John
1892 Pottenger, John
1892 Powis, A.
1891 Rastrick, E. L.
1891 Rastrick, F. J.
1881 Reynolds, T. W., M. D.
1990 Roach, George
1892 Robertson, R. A.
1882 Robinson, W. A.
1892 Ross, Lucien, G.
1892 Rutherford, Geo.
1887 Sanford, Hon. W. E.
1892 Sanford, E. Jackson
1890 Schofield, W. H., B. A.
1880 Scriven, P. L.
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1892 Southam, Richard
1890 Staunton, F. H. Lynch-
1890 Staunton, George Lynch-
1890 Stratton, A. W., B. A.
1892 Swanzie, Miss Kate G.

1892 Sweet, David
1892 Sweet, Harry
1892 Smith, J. H.
1892 Sykes, W. J., B. A.
1892 Thompson, R. A., B. A.
1881 Tuckett, Geo. E.
1891 Turnbull, A. C.
1892 Turnbull, J. D.
1892 Turnbull, W. R.
1880 Turnbull, William
1891 Turner, J. B., B. A.
1892 Turner, W. J.
1891 Tyrrell, J. W., C. E.
1881 Vernon, Elias, M. D.
1887 Walker, A. E.
1892 White, Wm.
1888 Williams, C. J.
1881 Williams, J. M.
1892 Wilson, Wm.
1857 Witton, H. B.
1885 Witton, H. B., Jr., B. A.
1891 Witton, J. G., B. A.

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