

PROCEEDINGS

OF THE

Nova Scotian Institute of Science.

SESSION OF 1894-5.

ANNUAL BUSINESS MEETING.

Provincial Museum, Halifax, 12th November, 1894.

PROF. GEORGE LAWSON, LL. D., PRESIDENT, in the chair.

The minutes of the last annual meeting were read and approved.

The PRESIDENT addressed the Institute as follows :—

GENTLEMEN,— We have assembled this evening as Members of the NOVA SCOTIAN INSTITUTE OF SCIENCE, for the performance of two distinct duties,—first, to close the session of 1893-94, which we now speak of as past ; and secondly, to enter upon the operations of another year and lay plans for the future. We are thus required, Janus-like, to put on two faces, one looking backward, the other forward. The annual address must be to a large extent a looking backward, for it is expected we shall give some account of our stewardship. It is my place as president to deliver the address on this occasion, because a year ago you thought fit to appoint me to fill your most honorable office. I was conscious that you might well have made a better choice, for I felt that the president of a scientific body like this should be prepared to give time and energy for more arduous labor than that of sitting in a chair at the monthly meetings. I was not ignorant of the fact that the most active workers are apt to entertain an abnegative spirit in regard to such things, to shirk prominence and seek gratification in the quiet pursuit of knowledge rather than the attainment of personal distinction. While this

spirit was to be respected, it did not afford a sufficient reason for my acceding to your request; but, on the other hand, I knew that the compliment which you wished to pay me after thirty years' membership of the Institute was sincere, and was actuated by the kindest feelings. When, moreover, I was assured of substantial help from the resident vice-president and secretaries, it seemed that no other course was left me but to accept the position, to thank you all for the honor conferred upon me, and proceed to do what I could in discharge of the duties so undertaken.

And now that my term of office is completed, I ask your attention to a brief review of the operations of the year. This will enable us the better to realize our position in the present, and to forecast the work that remains for the future. So fortified, we may make a fresh start.

It is pleasing to be able to record that this year our membership has not been reduced either by death or resignation. Our list has been increased by the admission of seven ordinary and two corresponding members.

During the session, seven ordinary monthly meetings for the reading of scientific papers were held. At these meetings twenty papers were read; their subjects presented considerable variety. The session commenced, in accordance with our laws, with the annual meeting of members of 8th November, when Dr. Martin Murphy, the retiring President, read an address, in which he reviewed the work of the by-gone year. On the same evening an ordinary public meeting was constituted. The first paper read was by Prof. MacGregor, of Dalhousie College, on the isothermal and adiabatic expansion of gases; its object was to show how certain important laws of the expansion of gases extensively employed in the study of heat engines, and usually demonstrated by the aid of the calculus, may be demonstrated by the use of elementary mathematical methods. The demonstration of these laws was thus brought within the comprehension of engineers who had not had the advantage of an extensive mathematical training.

At the December meeting, Dr. Somers called attention to the native forms of juniper, giving details of his observation of the variations in habit of these plants, and exhibiting living specimens showing more particularly the upright arborescent or tree-forms of *Juniperus communis*, a species which, both in Europe and America, commonly appears on bare hills and sand-dunes as a depressed bush without any

erect main stem. He also exhibited a stuffed specimen of *Lanius borealis*, and read notes on its butcher-bird habits, distribution, and local occurrence. Both of these subjects elicited information from members of observations they had made. The discussion that ensued in regard to the juniper-forms led to expression of the view that depressed and bush forms of *Coniferæ* are to be regarded in general, not as incipient trees in process of development or evolution, but rather as degenerate or dwarfed forms of species that now exist, or have formerly existed, normally as trees. We do not now have the proper forest-tree-form of *Juniperus communis* anywhere, but our native yew bush, *Taxus Canadensis*, while it occurs nowhere on *this* continent as a tree, is believed by many botanists to be conspecific with the English yew, the trunk of which attains great size as well as antiquity ; it is the tree that furnished wood for bows to the English bowmen. Mr. Guildford R. Marshall, Principal of Richmond School, gave an account of the observation of earthworms on roofs, etc., as if they had fallen in a shower ; the facts narrated suggested several possible explanations of the phenomenon, in connection with which details of the habits of these familiar but despised creatures were brought forward by members. At the same meeting, the President offered remarks on some features of the Kentucky Flora, pointing out the prominent differences in the vegetation of the Kentucky plains or low-lands from that of Nova Scotia, while the hill or mountain plants were, in certain cases, identical with our species, or presented equivalent forms. These remarks were founded on, and illustrated by, specimens collected during the season by Mr. Kearney, of the Botanical Department of Columbia College, New York where much good botanical work is being done.

At the January meeting (1894), Dr. Gilpin, Deputy Commissioner of Mines, gave a geological description of the Nictaux iron-ore-field, which has of late years acquired increased economic importance. The reading of this paper led to an interesting discussion on the general geological features of the district, which was familiar to Dr. A. P. Reid and other members present. Mr. Doane, our City Engineer, gave an account of the operation of the "Kennedy Scraper," so-called, and an explanation of the cause of a recent failure in its working when introduced into the city water pipes. The interesting history of this invention for automatically freeing water-pipes from rust-incrustation was detailed, the apparatus shown, its mode of working described, and its use in our city water works fully explained.

The February meeting was occupied with botanical subjects. Notes were given on the botanical and commercial history of Nova Scotian foxberries, an export trade in which has been developed to a surprising extent within the last few years, especially in Guysborough County. Mr. G. H. Cox, B. A., communicated a list of plants collected in and around the Town of Shelburne, on the Atlantic Coast of our Province, in the years from 1890 to 1893. The Institute had previously given space in its Transactions (vol. VI, pp. 209-300, and pp. 283-285) to two similar lists of native plants of Truro, in Colchester County, by Dr. George G. Campbell, which are supplemented this year by a list of additional species collected in that locality by Percy J. Smith. Such lists as these, when prepared with care, form valuable material for the preparation of local floras, as well as for Provincial or more general works, and the opportunity should not be lost to call attention to the substantial service that may be rendered to botanical science by the preparation of such lists for localities throughout the Province by those who have opportunities, by residence or otherwise, for local observation and collection.

The March meeting was taken up with astronomical and chemical subjects. Mr. Cameron, Principal of Yarmouth Academy, whose papers on astronomical observation, published in the periodical press at different times, have so greatly interested the general public, gave us his notes of observations on Venus. These notes may be regarded as a sequel to his previous papers on that planet, of which he has for some years made a special study, with regard more particularly to her visibility from the earth under the changing conditions of elongation from the sun, brilliancy, position, and state of our atmosphere. It seems desirable, therefore, to advert briefly to the general results reached by the author in each of his two previous papers.

In the first volume of the second series of our Transactions, Session 1892-93 (pp. 148-159), Mr. Cameron dealt with the enquiry: On how many (astronomical) days in the year may Venus be seen with the naked eye? The answer to this question involved a discussion of the motion and changes of the planet and of the geometrical conditions upon which her brilliancy depends. By constant watchfulness he succeeded in recording a valuable series of observations at Yarmouth, while notes of others made at Marseilles were obtained from M. Bruguere, who had been engaged on the very same work for several years before. During

1890, when Venus began her season as evening star with the superior conjunction of February 13th, and ended with the inferior conjunction of December 4th (a period of 290 days), Mr. Cameron saw her with the naked eye as early as March 16th, and Mr. Bruguiere as late as November 29th, so that she was visible to the naked eye that season on 259 days out of the total 290. In his second paper (Trans. Inst., ser. 2, vol. 1, pp. 345-358), our author dealt with the visibility of the planet in *daylight* to the naked eye and with aid of the opera-glass, and effectually dispelled the common notion that Venus could be seen with the naked eye in daylight on very rare occasions only. From the long course of patient, I might say persistent, observations made, Mr. Cameron was enabled to determine that on the average, out of every 100 days there are 84 on which any star-gazer with a fairly good eye can see Venus in daylight, if the weather permits and if he knows where to look for her. The paper of the past session brings the bright planet before us in another role, its object being to detail observations of her performance of the two characters of *evening* and *morning* star "at the same time," and to explain the conditions which bring about this phenomenon. The paper will be found *in extenso* in the forthcoming part of the Transactions now passing through the press. One feature of these papers ought not to be omitted; they consist not of mere observations and results (although it will be seen that these are of great interest), but give details explaining clearly the facts necessary to be known by those who, without having the advantage of previous training in systematic observation, may wish to observe for themselves the phenomena so well described; these papers will thus serve as a guide to young observers, and may help to correct the fault which their author finds with the general public, who, nowadays, he thinks, are not much given to looking heavenward either by night or by day. We wait with expectancy for the next secret which Mr. Cameron is going to wrest from the fair star of his affection.

At the same meeting, Mr. F. J. A. McKittrick, B. Sc., communicated a paper on the measurement of the resistance of electrolytes; it consisted chiefly of a report of research work done in the Physical Laboratory of Dalhousie College under Prof. MacGregor, and may be regarded as an earnest of still more important work that is expected from Mr. McKittrick in the future, for he was this year nominated by the University Senate, and accepted by Her Majesty's Commissioners of

the London Exhibition of 1851 as recipient of one of their Science Scholarships. This scholarship, of the annual value of one hundred and fifty pounds sterling, is tenable for two years on the condition that, during his tenure, the holder shall devote himself wholly to study and research, more especially in some branch of science, such as physics mechanics or chemistry, the extension of which is especially important to our national industries. The Senate's nomination to the Royal Commissioners was accompanied by a copy of Mr. McKittrick's paper from the Institute's Transactions to show the author's capacity for research work.

Mr. D. M. Bliss, electrician, Amherst, in a paper titled, "The coming development of artificial illumination," set forth a number of interesting facts and problems that are now engaging the attention of electrical engineers, and that are not only of scientific interest, but also prospectively of economic importance to civilized communities.

Mr. John Forbes, whose mechanical inventions in connection with iron manufactures have brought fame to our city, presented us with a review of some modern methods in manufacturing, with suggested analogies from a study of the evolution and nature of some of the processes employed. The reading of this paper led to an interesting discussion on the processes of manufacture of the different kinds and qualities of iron and steel, the observations of the speakers being well illustrated by a series of samples exhibited by Mr. Forbes, which showed the several progressive steps in the processes of manufacture.

Our April meeting was held in the Church of England Institute building; the attendance was unusually large, both of ladies and gentlemen, notwithstanding the disagreeable weather. The evening was entirely devoted to a paper by Dr. D. A. Campbell, titled, "General considerations concerning Bacteria, with notes on the bacteriological analysis of water." Dr. Campbell had studied Bacteriology at Johns Hopkins University, where unusually ample facilities are offered, and he has continued the investigation since his return to Halifax. In this paper he gave a clear exposition of the most important results of bacteriological enquiry up to the present time. He described the principal forms of bacteria, with respect to their characteristic features in form and size, the changes which they undergo, the parts they play in the economy of nature, as in putrefactive processes, in converting organic substances

into suitable compounds for plant food, and in their relation to such diseases as anthrax in the lower animals, and diphtheria and cholera in the human race. The author described the general methods of bacteriological work, the modifying modes of culture by which vaccines are produced, and showed the several forms of apparatus and appliances used. The whole subject was admirably illustrated by preparations and live cultures shown under excellent microscopes. The water supplied to the City of Halifax had been examined, and was found to be remarkably free from deleterious bacteria ; the author, however, offered suggestions as to keeping the lakes clear of decaying vegetable matter that might at any time menace the health of the city. The animated discussion that followed was a feature of the meeting. Dr. A. H. Mackay, who had also studied the subject, showed by calculation the prodigious rate at which bacteria multiply, and enforced upon the audience the object lesson of necessity for scrupulous cleanliness in the kitchen which the fleeting life-histories of the bacteria taught us. Dr. Somers expressed his belief that the investigation of bacterial phenomena was of scientific interest, but he could not admit that the germ theory of disease had been established. Dr. A. P. Reid, on the other hand, regarded bacteriology as of vital importance to the medical profession, and to the people, and congratulated the Institute on being the means of presenting to the community an exposition and illustration of this subject that every one could appreciate ; to-night, he said, for the first time in the history of medical science in Halifax, the living and moving bacillus of cholera had been shown.

The May meeting, being the last of the session, was overcrowded with papers ; eight were brought forward, several having lain over from previous meetings. Some had to be read by title only. The first was a notice of a new test for Antipyrine, by the President. Antipyrine is the therapeutical name and that commonly used, for the chemical compound properly called oxy-phenyl-dimethyl-pyrazole, or phenyl-dimethyl-pyrazolon ; it belongs to the great class of aromatic compounds, of which Benzene CH_6 is the type ; but it differs from the benzene derivatives in containing a pentagonal in place of a hexagonal nucleus, The chemical constitution of the compound was explained by means of diagrams of the graphic formulæ of related compounds, and the several known tests were shown. The special test referred to for detecting, or confirming the detection, of this compound, is the re-action obtained by prolonged boil-

ing with strong nitric acid, a brilliant solution somewhat like that of roseine, but with a purplish tinge, being produced.

Dr. MacKay, the Superintendent of Education, presented a valuable summary of observations for the season of 1893, of the dates of flowering of plants, and of the appearing of migratory birds. Dr. Somers exhibited and described a sponge obtained by Mr. Andrew Sullivan, one of our fishermen, at the neighbouring fishing village of Herring Cove; it has not yet been identified with any described species. Mr. H. Piers gave valuable notes on Nova Scotian Zoology. Dr. Henry Ami, of the Dominion Geological Survey, contributed an account of a collection of silurian fossils from Cape George, Antigonish County, with descriptions of three new species. Dr. R. W. Ells gave notes on sedimentary formations on the Bay of Fundy coast. Mr. W. H. Prest's Observations on Deep Mining in Nova Scotia concludes our catalogue of papers read during the Session of 1893-94.

At the thirteenth meeting of the Royal Society of Canada, held in May, 1894, the Institute was represented by our Vice-President, Dr. A. H. MacKay, who presented a report of our operations during the year; this has been printed in the Royal Society's Minutes of Proceedings for 1894, pp. xxvii-xxviii.

Having thus briefly dealt with the work of the session just closed, I may be permitted as an old member to extend my remarks to the circumstances under which the Institute originated more than thirty years ago, although the time now available will not admit of more than a mere glance at its early history and progress.

This Institute was originally organized in the winter of 1862-63, the former being the year of the London International Exhibition. Long before that time the Mechanics' Institute formed a centre of scientific and literary life in the City of Halifax, but it had then ceased to exist, leaving its museum as a memento in the old building of Dalhousie College. About the time when the proposal to hold the London Exhibition of 1862 was announced, it was felt here that it would be of substantial advantage to the Province to make known its resources and products to the world, and this International Exhibition seemed to offer a fitting opportunity for doing so. It was accordingly determined to collect and forward a suitable contribution of specimens to the exhibition. This was a new kind of work in Nova Scotia; the task proved an arduous one,

although the government was liberal in providing the means for obtaining what money could purchase, and those who were engaged in carrying out the work felt especially the need of scientific help in placing the products of the country before the nations of Europe. Thus was suggested the great want of some permanent organization to foster the scientific spirit in Nova Scotia. A society had been recently formed for the reading of literary papers. Some of the more active members were now engrossed with the arrangements for the Nova Scotian exhibit in London, and the literary society readily gave place to an organization of a scientific kind under the name of the Nova Scotian Institute of Natural Science. The inaugural address was delivered by PHILIP CARTERET HILL, D. C. L., President, who died rather suddenly at Tunbridge Wells in September last, and to whose memory there is an appreciative notice in the last issued number of the King's College Record. As mayor of the city, provincial secretary and premier of the Province, and in other important positions, he took an active part in civic and Provincial affairs. He afterwards removed to England, and during his residence there had been engaged in religious and philanthropic work, occasionally also contributing to the literary journals. He is pleasantly remembered by many citizens of Halifax as a genial, benevolent, scholarly, Christian gentleman.

In his inaugural address, at the first meeting of the Institute, Dr. Hill pointed out that however great the ardor or untiring the efforts of individual laborers in science might be, their isolated labors would really tend but little to enlarge the boundaries of human knowledge. Communication with each other, every laborer in the field casting his contribution into a common receptacle, whence all could freely draw, could alone give those results of individual effort their highest value. "It is then," he said, "to aid in this important work, and to afford a well constructed and organized channel for the contributions to the general stock of knowledge of those among ourselves who are interested in the fascinating fields embraced in the term 'natural science,' that the Nova Scotian Institute has been established. Should our hopes not be disappointed, we look forward to the time when our 'Transactions' shall be exchanged with older and more important institutions, and any new and well authenticated fact, having passed the ordeal of our own local organization, shall be transmitted to the great centres of science, and become the property of the whole world. * * The object of the Institution is to stimulate effort, and to aid and encourage the student by giving a recognized position and permanency to the results of his labors. If we

succeed, in however limited a measure, in effecting this object, our intention in founding the association will be fulfilled, and our humble efforts for the promotion of science and the elevation of our native land will be abundantly rewarded." The Hon. Dr. Hill could hardly have expected then that these prophetic utterances would have been so fully realized as they were in his own lifetime, for, owing to the strenuous exertions of some of our members, chiefly I believe Dr. MacGregor and Mr. Maynard Bowman, there is now no country under the sun whose scientific societies (where such exist) do not have our Transactions on their library shelves as exchanges for their own. The exchange list presented this evening shows that our annual distribution of Transactions to such libraries throughout the world amounts to upwards of seven hundred copies.

While sentiments such as those expressed in Dr. Hill's address were entertained by the organizing members who looked to the Institute they were creating as an association for the promotion of pure science, it was no doubt felt, on the other hand, by the business or more practical classes of the community, that the want of home information in regard to our industrial resources in general, and our mines and minerals particularly, was a great evil, restraining the progress of our industries,—for coal mining was going on apace, iron was being produced at Londonderry, gold had been discovered at Tangier, and was being picked up in other places along the Atlantic coast. Such memoirs on the new mineral industries as had been prepared, either by native scientists or professional miners, were then necessarily published beyond the Province. Thus, in a paper by Prof. How of King's College, read to the Institute on the 4th April, 1864, on iron ores, he remarked: "Many facts have been given in original papers by myself, and others, published almost exclusively out of the Province, during the last few years, and are scattered through the pages of various periodicals; * * * and I propose, now that an Institute of Science exists in the Province which has a prospect of permanence and an established system of publication of its Transactions, to offer for the consideration of its members, from time to time, such notes on the minerals of Nova Scotia as I hope will be acceptable and useful."

For thirty-two years the work of the Institute has gone steadily on. The monthly meetings have been regularly held; the channel for publication of scientific papers has been maintained; the fasciculus of them under title of Transactions has been annually issued, and of late years we have been able to illustrate papers more freely.

Many who took part in the work during the early period of the Institute's history have passed away ; their names will not be forgotten. The papers they have left behind in our Transactions will be consulted and quoted by the generations to come of students working in the several departments to which they relate. Others have come in from time to time to take the places of those who dropped out of our ranks year by year, and, while we cannot boast of any great increase in our band of laborers, yet the Institute remains in an active state, annually turning out a certain amount of substantial work, and exercising, we trust, a healthy intellectual influence in the community. The proceedings at our monthly meetings may be of limited interest to the general public, but our door is always open to any who care to hear what progress is being made in matters of science in which our Province is interested. We are accumulating by exchange a reference library that will be of great service for future work, and we are only waiting for the necessary building accommodation to assist in filling up the collections of our Provincial Museum, so as to make them an adequate representation of the natural wealth of the Province, and afford to our own people and to visitors from abroad a view of our mineral, agricultural, forest, fisheries, shipping and manufacturing industries commensurate in some measure with their growing importance.

In conclusion, I would like to call attention in a prominent manner to the fact that we are no longer limited to the domain of *natural science*. With an abbreviation of name made some years ago to that of the Institute of Science, we extended our range so as to embrace all departments. Our membership has not in consequence increased in the proportion that might have been expected. Almost every kind of industrial work nowadays, except mere manual labor, requires, on the part of the worker, some acquaintance with scientific facts and principles, and, in certain cases, regular scientific training. With our advanced civilization and industrial development, surely there must be more persons in this Province devoting some portion of their time to scientific work than those whose names are inscribed on the membership roll of the Institute of Science. To all such we extend a hearty invitation to come and join us!

On motion of DR. SOMERS, a vote of thanks was presented to the President for his services during the past session.

The TREASURER'S report was read, and having been audited and found correct, was received and adopted.

The report of the LIBRARIAN shewed that a considerable number of Scientific Societies and other Institutions had been added to the Exchange List during the past year. The following is a statement of the number of scientific and other institutions, including societies, universities, government scientific offices, libraries, etc., to which the Transactions are sent, and from which exchanges have been received :

	NUMBER OF INSTITUTIONS	
	To which Trans- actions are sent :	From which exchanges are rec'd :
Great Britain and Ireland	126	59
France	62	21
Germany	87	57
Russia	18	11
Austria-Hungary	23	10
Norway	12	11
Sweden	11	6
Belgium	14	4
Netherlands	9	4
Italy	34	18
Switzerland	15	8
Servia	1	0
Spain	2	0
Portugal	1	0
Denmark	5	2
India	8	2
China	2	0
Malta	1	0
Mauritius	1	0
Straits Settlements	0	1
Japan	2	1
South Africa	2	1
Australasia	34	20
Brazil	3	1
Chili	1	1
Argentina	4	4
British Guiana	1	1
Central America	2	2
Mexico	4	4
West Indies	4	1
United States	156	96
Newfoundland	1	0
Canada (exclusive of Nova Scotia) ... 41 }	63	37
Nova Scotia		
Totals	709	383

The large excess in the number of institutions to which we send, over the number which send to us in return, is not due to reluctance on the part of other societies to exchange with us, but to a small extent to the fact that it has not yet been found possible to correspond with all the societies which we wish to have on our exchange list, and to a large

extent to the fact that we send our Transactions to a large number of institutions, such as libraries, museums, etc., which issue no publications which they can send us in return. In Canada, for example, all libraries of whose existence we are aware are placed upon our distribution list.

Seventy-five volumes,—all being publications in English,—have been completed and bound during the year. Many others have been completed, but have had to be left unbound owing to lack of funds.

So far as utility to members is concerned, the library still suffers from the inconvenience of its quarters. The greater part of it is in cases in a corridor of the Post Office building, the rest is in a room courteously furnished for the purpose by the Governors of Dalhousie College. The library is well arranged, so that the librarian can without difficulty obtain any book which may be desired. But the lack of a catalogue, and the hesitation of members to trouble the librarian to meet them either at the Post Office or at the College, prevents members from putting the library to its full use. It is to be hoped that, before very long, the Institute may be able to afford to possess rooms of its own, with a paid secretary and librarian, or that the scheme for the consolidation of the Legislative and other libraries in the city, and the provision of a building to accommodate both them and the Provincial Museum, which has been urged upon the local government for some time, may be carried out at an early date.

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

President—PROFESSOR GEORGE LAWSON, LL. D.

Vice-Presidents—ALEX. MCKAY, Esq., and EDWIN GILPIN, JR., Esq., LL. D.

Treasurer—W. C. SILVER, Esq.

Corresponding Secretary—PROF. J. G. MACGREGOR, D. Sc.

Recording Secretary—HARRY PIERS, Esq.

Librarian—MAYNARD BOWMAN, Esq.

Councillors without office—A. H. MACKAY, Esq., LL. D.; MARTIN MURPHY, Esq, D. Sc. ; A. P. REID, Esq., M. D. ; F. W. W. DOANE, Esq., C. E. ; WILLIAM MCKERRON, Esq. ; JOHN SOMERS, Esq., M. D. ; WATSON L. BISHOP, Esq.

FIRST ORDINARY MEETING.

Provincial Museum, Halifax, 12th November, 1894.

The PRESIDENT in the chair.

Much time having been occupied by the annual business meeting which had just adjourned, the reading of papers was deferred until the next meeting.

SECOND ORDINARY MEETING.

Legislative Council Chamber, Halifax, 10th December, 1894.

The PRESIDENT in the chair.

It was announced that the following had been duly elected members :—W. H. PREST, Esq., Chester Basin, N. S. ; REV. W. M. FRASER, B. A., B. Sc., Halifax ; W. H. MAGEE, Esq., Ph. D., High School, New Glasgow ; E. E. FAVILLE, Esq., Director, N. S. School of Horticulture, Wolfville ; REV. JAMES ROSBOROUGH, Musquodoboit Harbour ; ALEXANDER DICK, Esq., Halifax ; C. E. WILLIS, Esq., M. E., Halifax ; L. H. WHEATON, Esq., Chief Engineer, Coast Railway Company, Yarmouth.

A paper by PROF. L. W. BAILEY, entitled, "Notes on the Geology and Botany of Digby Neck," was read by the Corresponding Secretary. (See Transactions, p. 68.)

DR. A. H. MACKAY read a paper on "A Foraminiferous Deposit from the bottom of the North Atlantic." (See Transactions, p. 64.)

THIRD ORDINARY MEETING.

Legislative Council Chamber, Halifax, 14th January, 1895.

ALEXANDER MCKAY, Esq., VICE-PRESIDENT, in the chair.

It was announced that C. F. HALL, Esq., and H. W. JOHNSTON, Jr., Esq., C. E., of Halifax, had been elected ordinary members, and F. H. MASON, Esq., F. C. S., an associate member.

DR. MACKAY presented "Additional Notes on Globigerina Ooze and Stones obtained by the S. S. 'Minia' from the bottom of the North Atlantic." (See Transactions, p. 64.)

A paper by T. C. WESTON, Esq., F. G. S. A., entitled, "Notes on Concretions found in Canadian Rocks," was read by the CORRESPONDING SECRETARY. (See Transactions, p. 1.)

On motion of DR. MACGREGOR and MR. FORBES, it was—

Resolved, That the Institute express its deep appreciation of the great services which MR. ALEXANDER MCKAY has rendered it in his discharge of the duties of Recording Secretary for a period of fourteen years; and that as a mark of its appreciation of his services, the Institute elect Mr. MCKAY to Life-membership, without payment of the usual fee.

FOURTH ORDINARY MEETING.

Church of England Institute, Halifax, 11th February, 1895.

ALEXANDER MCKAY, Esq., VICE-PRESIDENT, in the chair.

DR. GILPIN, Inspector of Mines, read a paper entitled, "The Iron Ores of Nictaux, N. S., and Notes on Steel-making in Nova Scotia." (See Transactions, p. 10.)

In the discussion which followed DR. A. H. MACKAY gave a popular description of this region which he illustrated by means of a large outline map. Starting from the Railway Junction of Middleton and following the railway across the Annapolis Valley for four miles in a southerly direction, over the sand and gravel which rest on Triassic beds, one arrives at the foot of the South Mountain range, where the Nictaux River in its course nearly magnetic north, debouches from its rocky gorge channelled through the Highlands. From Nictaux Falls station the railway enters into the gorge, creeping higher and higher along its western side. Just at the foot of the hills upper silurian slates appear to show themselves, and the railway cuts every now and then great dykes of igneous rock which at various times rent the slates in numerous fissures. Two miles up from the falls, in what appear to be of lower Devonian age, the river and railway line at Cleveland cut at an oblique angle, approximately vertical strata of magnetic iron ores generally highly siliceous. One mile further up, and the road passes through a great intrusive granite belt about a mile in width. Then comes a great rock excavation through a bluff of very hard slates, when the course is again in the granite and tending south-westerly to Alpena Station, six miles above the Falls. During the two weeks he was in this district, he

studied the country to the west of the Nictaux as far as Jones' Brook, and to the east as far as Tor Brook. The iron strata at Cleveland appear to show themselves to the south-west near Jones' Brook over two miles distant and beyond the mile belt of intrusive granite. To the north-east of Cleveland, for a distance of four miles, there are several outcrops of probably the same strata, the iron of which is hæmatitic instead of magnetic. At the north-eastern end of this line which runs parallel with the course of the Tor Brook for over two miles, are the Tor Brook Mines, where a large quantity of valuable hematite was being mined. This iron belt then appears to be at least six miles long, cutting the general magnetic north and south course of the Nictaux at Cleveland, as a line running from the south-west (declining to the west) two miles across the granite ridge referred to, to Tor brook, four miles to the north-east.

Allusion was made to the interesting character of the geological problem, to which our two greatest geologists have been giving different solutions. Sir Wm. Dawson thought the palæontology of the iron beds would place them as high as the Oriskany, the base of the Devonian, and therefore higher than the rocks near the Nictaux Falls which might be Lower Helderberg and Niagara (Upper Silurian). Dr. Honeyman would put the iron beds lower even than the Niagara—as low as the Clinton if not the Medina. Collections of fossils were made at various points which had not then been examined, so that he would not venture to say whether later observations would justify any radical modification of the earlier hypothesis or not. The railway cuttings as well as mining explorations made in late years give geologists much better facilities for the complete study of the problem. But with all the new facilities the original hypothesis does not appear to be substantially disproved.

Observations were also made on surface geology. Glacial erosion was widely exhibited, and in at least one section of a drift bank cut by the railway there was evidence of an older drift from north to south, as well as a later from south to north, down the slope of the land to the Annapolis Valley.

FIFTH ORDINARY MEETING.

Church of England Institute, Halifax, 11th March, 1895.

The PRESIDENT in the chair.

It was reported that MISS BERTHA ELLIOT, Superintendent of Nurses, Victoria General Hospital, had been elected an ordinary member, and S.

S. DICKENSON, Esq., Superintendent of the Commercial Cable, Hazelhill, Guysborough County, N. S., had been elected an associate member.

PROF. FAVILLE, Director of the N. S. School of Horticulture, delivered a lecture on "Some Important Scientific Problems in Horticulture," illustrated by a number of charts.

SIXTH ORDINARY MEETING.

Legislative Council Chamber, Halifax, 15th April, 1895.

The PRESIDENT in the chair.

It was reported that the HON. MR. JUSTICE WEATHERBE had been elected a member.

The following paper by MISS LUCY C. EATON, entitled, "The Butterflies of Truro, N. S.," was read by Mr. Piers :

1. *Vanessa antiopa*, L.—Very beautiful specimens of this butterfly are on the wing during the last of July. A full grown larva captured on the 11th of July, 1894, went into cocoon on the 12th and appeared as a perfect insect on the 26th of the same month. This species hibernates during the winter and appears in spring with its wings much worn and faded.

2. *Vanessa milberti*, Godt.—Also a hibernating species, and like the *antiopa*, common here.

3. *Argynnis atlantis*, Edw.—Very common. Is with us the greater part of the summer.

4. *Argynnis myrina*, Cram.—Not very common.

5. *Argynnis cybele*, F.—Not common.

6. *Papilio turnus*, L.—Our largest butterfly. Rare because of natural enemies.

7. *Pieris oleracea*, Har.—Native cabbage butterfly. Not very common.

8. *Pieris rapæ*, L.—Imported cabbage butterfly. Very common.
9. *Colias philodice*, Godt.—Clover butterfly. Quite common; may be seen during the greater part of the summer.
10. *Melitæa phæton*, Drury.—Very rare.
11. *Phyciodes tharos*, Drury.—Not very common.
12. *Phyciodes nycteis*, Doub.—Not common.
13. *Grapta progne*, Cram.—Not common.
14. *Grapta faunus*, Edw.—Not common.
15. *Grapta J-album*, Bd.-Lec.—Very rare.
16. *Limenitis arthemis*, Drury, (form *lamina*, F.)—Not common.
17. *Limenitis disippus*, Godt.—Not common.
18. *Neonympha canthus*, L.—Not common.
19. *Satyrus alope*, F.—This is a forest species and somewhat rare.
20. *Satyrus nephele*, Kirby.—Quite rare.
21. Intergrades between *alope* and *nephele*.
22. *Chrysophanus americana*, D'Urban.—This pretty little butterfly is very common, and is with us during the greater part of the summer.
23. *Pamphila mystic*, Edw.—Not common.
24. *Pamphila cernes*, Bd.-Lec.—Not very common.
25. *Lycæna lucia*, Bd.-Lec.—This beautiful little butterfly is very rare here. I have only captured one. It was taken in Victoria Park.
26. *Lycæna violacea*.—This species is also rare.

In reading the above paper, Mr. Piers made a number of observations upon the subject :

If the species named in the list had been correctly determined, he thought it would prove an interesting addition to our knowledge of the Lepidoptera of the province. All previous catalogues have emanated from Halifax, and carefully prepared local lists from other parts of the province, especially from the western section, are necessary before a full account of our butterflies can be presented.

An examination of Miss Eaton's paper suggests that more thorough search will doubtless show that many of the species mentioned therein as uncommon, are really generally less rare than stated in her notes. The many species spoken of as not common, and a comparison with the the relative abundance of the same species about Halifax and elsewhere in the eastern part of the Dominion, prompts such a surmise. In some cases the difference between the abundance of various species in this locality and in the Truro district, is doubtless a local difference, and therefore of great interest. There is no doubt that many species frequently met with in the western part of the province, are rare or even unknown on the Atlantic coast, and *vice versa*. For this reason, reliable annotated lists of species occurring at various stations throughout Nova Scotia are absolutely necessary before we can present a correct statement of the general abundance of the various species throughout the whole province.

Comparison with the catalogues of Belt, Jones, and Silver, makes it probable that a number of other species will yet be reported from Truro. The *Lycenidae* and *Hesperida* will doubtless furnish many representatives. The speaker was surprised at not finding in the list a few species which are common about Halifax, and whose occurrence at Truro might be expected. For example, *Pyrameis cardui* is common near this city, as well as generally throughout the eastern provinces of Canada, while *P. huntera* is abundant some years whilst rare in others. *P. atalanta*, which Belt and Jones considered rare or not common, Mr. Piers has found plentiful about Halifax where it has doubtless become more common during recent years owing to the increase of food. *Danais archippus*, although rare near Halifax, was said by the late Mr. Downs, on the authority of Mr. John Winton, to be not so rare along the valley of the Shubenacadie. Search should be made for all of these species in the vicinity of Truro.

Mr. Piers also made the following remarks upon a few of the species mentioned in Miss Eaton's paper :

Vanessa milberti. Both Belt and Jones reported that this species had been taken at Truro and Windsor, but had not been observed near Halifax. It is included in Mr. Silver's recent list (*Trans. N. S. I. N. S.*, vol. VII.)

Argynnis atlantis. This species, which resembles *aphrodite*, does not appear in the lists of Belt, Jones, or Silver, but Rev. C. J. S. Bethune

("Butterflies of Eastern Provinces of Canada," 1894) says that it occurs in Nova Scotia, as well as in Cape Breton, Prince Edward Island, and New Brunswick. It is common throughout northern Ontario and Eastern Quebec.

Argynnis myrina. Reported as not very common at Truro. It is a very common species about Halifax.

Argynnis cybele. This species does not seem to have been definitely reported from Nova Scotia proper,* but in Rev. C. J. S. Bethune's list of the butterflies of eastern Canada, (Rept. Ent. Soc. of Ont., 1894) we find it mentioned as having been taken in Cape Breton and Prince Edward Island. Its occurrence at Truro, if it has not been confounded with *A. aphrodite*, is interesting. *A. cybele* is very similar to this last-mentioned species. *A. aphrodite* is abundant near Halifax, and has been reported by Belt (?), Jones, and Silver, but it is not mentioned in the Truro list. This gives rise to a suspicion that some of the Truro specimens, upon re-examination, may prove to be *aphrodite*. It is very probable, however, that we have both species in Nova Scotia, and the attention of our entomologists is drawn to the subject. Specimens in Mr. Piers's own collection, taken in the vicinity of Halifax, are undoubtedly *aphrodite*.

Papilio turnus. Common at Halifax, but reported rare by Miss Eaton.

Militæa phaeton. As far as known, this species has hitherto been reported from but one spot in the Province, namely a meadow not far from Bedford Rifle Range, near Halifax. Its appearance in the Truro list is of great interest.

Phyciodes tharos. Very common near Halifax and elsewhere throughout the eastern provinces of Canada.

Phyciodes nycteis. In Canada this species has only been collected in Ontario and Quebec, where it is not common. Have the specimens mentioned in the previous list, been correctly referred to this species? Its occurrence in Nova Scotia is somewhat unexpected.

Grapta faunus. Rev. C. J. S. Bethune notes its occurrence in Nova Scotia ("Butterflies of Eastern Provinces of Canada," Rept. Ent. Soc. of

* Consult, however, Mr. Belt's remarks in *Trans. N. S. I. N. S.*, vol. i, pt. 2, p. 89, from the wording of which it is possible that he had found both *aphrodite* and *cybele* in the province.

Ont., 1894). Consult also Mr. Belt's notes on pages 90-91 of his paper (*Trans. I. N. S.*, vol i, pt. 2).

Neonympha canthus. Not mentioned by Mr. Belt or Mr. Silver, but Mr. Jones reports it, under its synonym *Neonympha boisduvallii*, as having been taken by Mr. John Winton at Lower Stewiacke, Colchester County. A specimen from that locality was in Mr. Jones's collection.

Lyceena lucia and *violacea* (winter forms of *L. pseudargiolus*). Miss Eaton speaks of these forms as rare at Truro. The species is very abundant about Halifax in the spring, and is familiar to trout fishermen under the common name "Jenny Lind."

DR. MARTIN MURPHY, Provincial Engineer, read a paper entitled, "A Cheap and Effective Bicycle Track for Rough Country Roads," which was followed by an interesting discussion.

SEVENTH ORDINARY MEETING.

Legislative Council Chamber, Halifax, 13th May, 1895.

ALEXANDER MCKAY, Esq., VICE-PRESIDENT, in the chair.

It was announced that MELVILLE G. DEWOLFE, Esq., of Kentville, N. S., had been elected an associate member.

The report of the Institute, to be presented by DR. SANDFORD FLEMING at the forthcoming meeting of the Royal Society of Canada, was read by the Secretary.

HARRY PIERS, Esq., read a paper entitled, "Relics of the Stone Age in Nova Scotia." The paper was illustrated by a collection of stone implements and drawings. (See Transactions, p. 26.)

A paper by REV. ARTHUR WAGHORNE of St. John's, Newfoundland, on the "Flora of Newfoundland, and S. Pierre et Miquelon," was read by title. (See Transactions, p. 83.)

DR. A. H. MACKAY, Superintendent of Education, presented a paper entitled, "Phenological Observations made during 1894." (See Transactions, p. 59.)

WATSON L. BISHOP, Esq., exhibited a specimen of quartz, one side of which was flat and striated. It had been found by Mr. J. R. Glendinning about six feet below the surface in an earth cutting by the roadside at the foot of the First Lake, Dartmouth, N. S.

The following papers were read by title :—

“ Note on Coal Gas as a Probable Source of Argon.” By PROF. G. LAWSON.

“ On the Visibility of Mercury to the Naked Eye.” By A. CAMERON, Esq., Principal of Yarmouth Academy.

“ Tidal Erosion and Deposition in Minas Basin.” By PROF. A. E. COLDWELL, Acadia College, Wolfville, N. S.

“ True Surfaces and Accurate Measurements.” By D. W. ROBB, Esq., A. S. M. E., Amherst, N. S. (See Transactions, p. 21.)

A bound copy of CAPT. TROTT'S paper on Submarine Cables was presented by the author to the library of the Institute.

HARRY PIERS,

Recording Secretary.