

PROCEEDINGS
OF THE
Nova Scotian Institute of Science.

SESSION OF 1914-15.

(VOLUME XIV, PART 1.)

ANNUAL BUSINESS MEETING.

*Civil Engineering Lecture Room, Technical College, Halifax.
21st October, 1914.*

THE PRESIDENT, DONALD M. FERGUSSON, F. C. S., in the chair.

Other members present: DR. A. H. MACKAY, PROF. E. MACKAY, DR. D. FRASER HARRIS, M. BOWMAN, PROF. H. L. BRONSON, PROF. D. S. McINTOSH, W. MCKERRON, and H. PIERS.

PRESIDENTIAL ADDRESS: (1) Review of the Institute's Work during the Year, (2) Remarks on Valency, (3) General Remarks.—By DONALD M. FERGUSSON, F. C. S.

It is the duty of your president at the annual meeting to speak of members deceased. That, on this occasion, is unnecessary, for, so far as I know, we have suffered no loss by death this session.

Review of Year's Work.

During the year we have had ten papers presented at our meetings, and the subject matter contained contributions in the botanical, chemical, physical, geological and physiological sciences, so that the papers read, though not above our average in number, were varied and represented different fields of research; and I may say that all the papers embody the results of much patient work and are valuable stepping stones in the path of scientific progress.

The paper that evoked the most animated discussion was that of Dr. Fraser Harris on "Coloured Thinking." Much of our recent work has been in the physical sciences, and this departure into mental science met with a hearty welcome.

Of especial practical value to the Province is the series of analyses of Nova Scotian soils contributed by Prof. Harlow. Last year we had a paper from Prof. McIntosh on the geology of the contact zone at the North West Arm; this year Mr. Vickery gives us the analysis of the contact rock locally known as ironstone. This term is somewhat of a misnomer, as "ironstone" is usually applied to an impure iron ore, but the term is used locally on account either of hardness or of the colour of the weathered rock. To contact-metamorphosed rock the general term hornstone or hornfels has been applied. We should have for this local rock of commercial utility some name for common use that would be lithologically correct.

I cannot refer to all the year's work, but I would mention the paper by Mr. J. H. L. Johnstone "On the Electrical Properties of Acetic Acid in the Solid and Liquid Phases." This, following one last year by the same author on the "Conductivity of Ice" shews one trend of present chemical research.

Remarks on Valency.

For many years past our Institute, like other scientific societies, has received papers on measurements of the dis-

sociation of various electrolytes. This field has been well explored, and the dissociation constants of nearly all electrolytes in water solution are known. Much attention is now being given to solvents other than water, and to organic substances, and, as in these papers, to matter in the solid state.

The general acceptance of Arrhenius' theory of electrolytic dissociation has led to our text books of inorganic chemistry and analyses being re-written in ionic terms. According to this, when a molecule of an electrolyte like NaCl is dissociated in solution we have a positive Na ion and a negative Cl ion. A number of years ago Sir J. J. Thomson, in his hypothesis of the electrical nature of matter, suggested that valency and cause of chemical combination consisted in the transfer of electrons between the reacting atoms. On this basis we have as positive atom one which has lost one or more electrons, and as negative atom one which has gained one or more electrons, the valency of the atom depending on the number of electrons transferred. The valency question is one of the fundamental problems of chemistry and the electronic theory has in many forms been applied as a solution. Electrolytic dissociation tells us nothing of the solid state or the gaseous. In dissociation we find H as a positive ion and Cl as a negative. What is the state of the atoms in the electrically neutral molecule of Cl? In the majority of reactions there seems to be no difference between the two halves of the molecule, but some evidence has been found that the Cl atom may act positively. On the assumption that the diatomic gas molecule consists of one atom positive and the other negative, we have theories of valency, one of which applied to the formula of the benzene ring I shew on the blackboard. Any conception of valency must pass the test of the benzene ring and explain certain peculiarities in the formation of ortho, meta, and para compounds.

In general terms of the electronic theory, the loss of electrons corresponds to oxidation, and a gain of electrons

to reduction. Many reactions are classed as oxidizing without reference to oxygen, and the term "adduction" has been proposed as the opposite to reduction: adduction means the adding of positive charges, and reduction the withdrawal of the same.

Many different electronic hypotheses have been put forward, some not involving transfer of electrons; but the final solution will come from the physicists who gave us the electron. Sir J. J. Thomson, who at one time stated that atoms of one and the same kind may be positive and negative and combine to form a diatomic molecule, in his recent work on Positive Rays, considers that for a union of atoms it is not necessary that one be positive and the other negative, but that a displacement of positive and negative electricity in each atom takes place.

It has recently been shown that if electrons are transferred in oxidation and reduction they are not the same as the beta particles evolved in radioactive changes.

Within this last two years there has been discovered a valuable method of exploring into the region of molecules and atoms. I refer to the discovery of reflection of X-rays from crystal surfaces. Interesting results are being given and, though one cannot anticipate the final outcome, we may soon have established the structure of the atom and the solution of the valency problem. Recent theories give us an atom consisting of a central positive nucleus surrounded by negative electrons. The central nucleus may not all consist of positive charges, but the net positive charge gives an atomic number corresponding to the place occupied by the element in the periodic table. In fact we are promised a periodic table containing all possible elements.

General Remarks.

As a scientific society we cannot but regret that the present war means great curtailment of research, especially on the

continent of Europe. It is hard to say what it will mean having supplies from Germany cut off, for from that country alone have come many of our necessary chemicals. On this continent it is evident that research is increasing in quantity and quality, coming not only from the universities but from governmental and endowed research laboratories and from those of private corporations, such as the General Electric Co., from the research laboratory of which I noticed recently a publication of which one of our life members was a co-author.

You will have reports presented to you from our Librarian and Treasurer, and from these you will see that we may have serious financial difficulties ahead of us. We must endeavor, however, to continue publishing the Transactions, not only for the sake of the Institute and the work of our members, but to act (as we have acted in the past) as the stimulus to scientific work in this Province by publishing the first research paper of many a student, who, receiving encouragement in the atmosphere of the Institute, leaves to make research his life work in the larger world of opportunity outside our shores.

The Treasurer, M. BOWMAN, presented his annual report, showing that the receipts for the year ending 21st October, 1914, were \$1,742.28; the expenditures, \$1,588.28; the balance in current account, \$154.00; the reserve fund, \$311.90; and the permanent endowment fund, \$1,000, the latter being now invested in Maritime Telephone Co. 6 per cent. bonds. The report, having been audited, was received and adopted.

DR. A. H. MACKEY reported that he had interviewed the Government, and urged the restoration of the money grant which had been received by the society for many years, and he felt there was a disposition to assist in some way.

The Librarian's report was presented by H. PIERS, showing that 1,766 books and pamphlets had been received by the Institute through its exchange list during the year 1913;

and 1,424 during the past nine months of the present year, 1914, viz. January to September inclusive. The total number of books and pamphlets received by the Provincial Science Library (with which that of the Institute is incorporated) during the year 1913, was 2,928. The total number in the Science Library on 31st December, 1913, was 51,810. Of these, 37,614 (about 72 per cent.) belong to the Institute, and 14,196 to the Science Library proper. Four hundred books were borrowed, besides those consulted in the library. No binding or direct purchasing has been done during the year. The report was received and adopted.

The following gentlemen were elected officers for the ensuing year (1914-15):

President,—DONALD MACEachern FERGUSSON, F. C. S.,
ex officio F. R. M. S.

1st Vice-President,—PROFESSOR DAVID FRASER HARRIS,
M. D., C. M., D. Sc., F. R. S. E.

2nd Vice-President,—PRESIDENT ARTHUR STANLEY MAC-
KENZIE, PH.D., F. R. S. C.

Treasurer,—MAYNARD BOWMAN, B. A.

Corresponding Secretary,—PROFESSOR EBENEZER MACKAY,
PH. D.

Recording Secretary and Librarian,—HARRY PIERS.

Councillors without office,—ALEXANDER HOWARD MACKAY,
LL. D., F. R. S. C.; PROFESSOR CLARENCE L. MOORE,
M. A., F. R. S. C.; ALEXANDER MCKAY, M. A.;
PROFESSOR DONALD SUTHERLAND MCINTOSH, M. Sc.;
CARLETON BELL NICKERSON, M. A.; PROFESSOR
HOWARD LOGAN BRONSON, PH. D.; and WILLIAM
HARROP HATTIE, M. D.

Auditors,—WATSON LENLEY BISHOP and WILLIAM MCKERRON.

On motion, the PRESIDENT, the two VICE-PRESIDENTS, PROF. BRONSON, PROF. SEXTON, and DR. HATTIE were appointed a committee to interview the Government in regard to the restoration of the financial grant to the Institute.

FIRST ORDINARY MEETING.

*Civil Engineering Lecture Room, N. S. Technical College,
Halifax, N. S.; 9th November, 1914.*

THE PRESIDENT, D. M. FERGUSON, in the chair.

GEORGE H. HENDERSON, B. A., B. Sc., instructor in physics, Dalhousie University, Halifax, read a paper on "The Distribution of the Active Deposit of Thorium in an Electric Field." (See Transactions, page 1). The subject was discussed by the PRESIDENT, DR. A. S. MACKENZIE, DR. BRONSON, and DR. E. MACKAY.

SECOND ORDINARY MEETING.

*Civil Engineering Lecture Room, N. S. Technical College,
Halifax, N. S., 14th December, 1914.*

THE PRESIDENT, D. M. FERGUSON, in the chair.

It was reported that PROFESSOR ALFRED G. HATCHER and LORNE N. RICHARDSON, instructor in physics and mathematics, both of the Royal Naval College of Canada, H. M. Dockyard, Halifax, had been duly elected ordinary members on the 9th inst.

PROFESSOR DAVID FRASER HARRIS, M. D., C. M., D. Sc., F. R. S. E., Dalhousie University, Halifax, read a paper entitled, "Neuro-muscular Rhythms and the Tremor of Tonus." The subject was discussed by the PRESIDENT, DR. A. H. MACKAY, DR. BRONSON, PRESIDENT MACKENZIE, and DR. E. MACKAY.

THIRD ORDINARY MEETING.

*Civil Engineering Lecture Room, N. S. Technical College,
Halifax, N. S., 11th January, 1915.*

THE PRESIDENT, D. M. FERGUSSON, in the chair.

HERBERT BRADFORD VICKERY, Dalhousie University, Halifax, read a paper entitled, "An Investigation of the 'Chromate Method' of Separating the Alkaline Earths." (See Transactions, page 30). The subject was discussed by the PRESIDENT, DR. E. MACKAY, C. B. NICKERSON, C. L. MCCALLUM, and DR. FRASER HARRIS. A vote of thanks was presented to MR. VICKERY.

FOURTH ORDINARY MEETING.

*Civil Engineering Lecture Room, N. S. Technical College,
Halifax, N. S., 15th March, 1915.*

THE FIRST VICE-PRESIDENT, DR. D. FRASER HARRIS, in the chair.

PROFESSOR HOWARD LOGAN BRONSON, PH. D., Dalhousie University, Halifax, read a paper entitled, "A Physical Measurement of X-Rays," (See Transactions, page 17). The subject was discussed by DR. A. S. MACKENZIE, DR. A. H. MACKAY, DR. FRASER HARRIS, and others.

FIFTH ORDINARY MEETING.

*Civil Engineering Lecture Room, N. S. Technical College,
Halifax, N. S., 12th April, 1915.*

THE PRESIDENT, D. M. FERGUSSON, in the chair.

PROFESSOR DONALD S. MCINTOSH, M. Sc., Dalhousie University, Halifax, read a paper entitled, "Notes on an Abnormal Wave Occurrence on the Northern Cape Breton

Coast in June, 1914." (See Transactions, page 41). The subject was discussed by the PRESIDENT, DR. A. S. MACKENZIE, DR. H. L. BRONSON, DR. E. MACKAY, H. PIERS, and others.

A paper by JOSEPH PERRIN, MacNab's Island, Halifax, entitled, "Additions to the Catalogue of Butterflies and Moths collected in the Neighbourhood of Halifax, etc.," was read by title, and a vote of thanks passed to the writer.

SIXTH ORDINARY MEETING.

*Civil Engineering Lecture Room, N. S. Technical College,
Halifax, N. S., 10th May, 1915.*

THE PRESIDENT, D. M. FERGUSSON, in the chair.

PROFESSOR D. FRASER HARRIS, M. D., D. SC., F. R. S. E., Dalhousie University, Halifax, read a paper entitled, "Accidental Electrical Stimulation of the Human Retina *in situ*." (See Transactions, page 47). The subject was discussed by PROF. E. MACKAY, C. B. NICKERSON, DR. FRANK WOODBURY, DR. F. W. RYAN, DR. A. H. MACKAY, and the PRESIDENT.

Dr. A. H. MACKAY presented a paper on "Phenological Observations in Nova Scotia, 1914." (See Transactions, page 57). The subject was discussed by H. PIERS.

HARRY PIERS,

Recording Secretary.