importance of this new factor as well as to the past and future of our country.

JAMES LOUDON.

UNIVERSITY OF TORONTO.

SECTION OF THE GEOLOGICAL AND BIOLOGICAL SCIENCES.

THE meeting of the Royal Society of Canada at Toronto, May 26–29, was one of great interest, especially so in regard to the value and importance of the papers and discussions in Sections 3 and 4, whose particular province is the study of the natural and applied sciences. The meetings were held within the precincts of the University of Toronto, whose ample halls and well-equipped laboratories were placed freely at the disposal of the Society. The beautiful 'Queen City' of Canada was bright with blossoms and the fresh-tinted foliage of the trees which so abundantly adorn her broad avenues. A generous welcome was extended by her citizens to the fellows and delegates of the Society who represented Canada from Halifax to Winnipeg. The meeting lacked the genial presence and active inspiration of Sir John Bourinot, the honorary Secretary, whose serious illness was a matter of deep regret to all. His rare executive ability and tact, and the control which he has so wisely exercised in guiding the Society during the twenty perilous years of its existence, are shown in the position which it occupies to-day. The stimulus which it has given to original research and the world-wide interest which the publication of its proceedings has awakened have been in a large measure due to his fostering care and unremitting industry.

Among the recommendations contained in the report of the honorary Secretary were the following: That everything possible should be done to preserve historical sites in Canada; that systematic ethnological work should be carried on; that the Canadian people should cooperate with the people of the United States and Mexico in determining the ninety-eighth meridian; and that the operations of the Government Marine Station of Biology should be continued and increased. During the meeting committees considered several of these recommendations and emphasized their importance in subsequent reports.

The address of the president, Dr. Loudon, of Toronto University, on 'Research in Universities,' was a careful presentation of the subject, showing what has been done—and what has not been done—in German, English, United States and Canadian Universities.

In Section 4 a large proportion of the papers read embraced topics on the geology of various sections of eastern Canada. One of the most important of these was a paper on the sites of ancient volcanic activity in the neighborhood of the St. Lawrence Valley, by Professor Frank D. Adams, of McGill University. After an introductory reference to the recent outbreak on the island of Martinique, Dr. Adams gave an account of the general geological structure and petrographical character of the series of ancient volcanic hills which rise from the Paleozoic plain to the east of Montreal. These are eight in number and are arranged along two parallel and almost straight lines, evidently ancient lines of weakness. Those situated on the most northerly of these lines, commencing from Mount Royal on the west and going east, are Mount Royal, Montarville, Belœil, Rougemont, Yamaska and Shefford. The distance from Mount Royal to Shefford Mountain is fifty miles. The mountains on the southern line are two in number—Brome Mountain and Mount Johnson. Of these hills Mount Royal (Mons Regius), at the foot of which the city of Montreal is situated, is the best known and may be taken as the type of the series. Dr. Adams proposes for the group

the name of the *Monteregian Hills*. These hills form a most remarkable petrographical province, consisting of a dual series of alkali-rich rocks, represented on one hand by the essexitetheralite series, and on the other by the pulaskite and nephelinesyenite series. There are also a great number of dyke rocks of consanguineous types, bostonites, tinguaites, monchiquites, fonchites, camptonites, alnoites, etc. The hills are erosion remnants of volcanoes or laccolites, dating back probably to Neo-Paleozoic times. Dresser, who has recently studied Shefford and Brome, considers them to be partially uncovered laccolites. About Mount Royal, on the other hand, a few remnants of the ancient tufa pile remain, showing that the molten material at this point found a passage to the surface.

A detailed description of Mount Johnson was given. This very interesting occurrence is 875 feet high and nearly circular in cross section, being a little over half a mile in average diameter at the base. It is a typical neck or pipe, consisting of theralite in the center, which passes gradually over into pulaskite on going outward to the periphery. It is situated about seven miles from the town of St. Johns, P. Q.

Dr. G. F. Matthew discussed some geological questions arising out of his studies of the Cambrian faunas of eastern Canada, especially the initial faunas of this system, to the examination of which he has devoted himself with great industry for many years.

Six genera (and subgenera) of brachiopods are found at the very base of the system; and it is seen that there is a gradual, though no very marked, increase in size of these forms when traced through the basal Cambrian faunas. The genera (and subgenera) found were—of Atremata—*Leptobolus, Obolus, Lingulepis* and *Lingulella* —of Neotremata, *Acrothyra* and *Acrotreta*. The first of these two was the only genus that exhibited no increase in size as time went on, and it was found only in the basal Cambrian (below the Paradoxides zone).

The increase of bulk of the individuals of these old genera during this Geological Age is in accordance with the development in this respect of higher forms of life, but less noticeable in degree.

Another subject taken up by Dr. Matthew was the development of the Canadian Oboli, as shown in impressions of the muscle scars, of the vascular trunks, and by the surface ornamentation of the shells.

It was stated that in the first determination of these shells we must often depend on the form, as this is the most obvious, and sometimes the only, available character.

But further knowledge of the nature of the species, as shown by the internal markings, etc., has proved that there are several independent lines of development of the Oboloid shells, and that the typical *Obolus* (*O. Apollonis*) is nearer in structure to the typical *Lingulella* (*L. Davisii*) than to these earlier species, which outwardly, as regards the form, are indistinguishable from *Obolus*.

Of these shells one type belongs to the Lower Etcheminian fauna, one to the Upper Etcheminian fauna, two to the Protolemus fauna (all these are below Paradoxides), one to the Peltura fauna, and one to that of *Dictyonema* (*D. flabelliformis*).

Another subject discussed in these notes was the evidence of the direction of the migration which brought these early faunas to the Atlantic region of Canada. It was shown that during the time when the Upper Etcheminian fauna prevailed in Atlantic Canada, there was a steady current setting along the then existing shores to the northeast. This is shown by the orientation of the valves of the inarticulate brachiopoda, the apices of the valves being directed to the southwest. Hence it is inferred that the migration of the fauna was

from that direction. This is the reverse of the conditions shown by R. Rudemann to have prevailed in northern New York during the time of the Utica state; the direction of the current there and then being shown by the attitude of colonies of graptolites, which are turned in a southwest direction.

Papers on local geology of Ontario and New Brunswick were presented by Professor H. S. Coleman, of Toronto University, and by Professor L. W. Bailey, of the University of New Brunswick.

An afternoon was spent by the geologists with Professor Coleman in examining the interglacial deposits at Scarborough Heights on the northern shore of Lake Ontario, near Toronto.

The papers by Professor D. P. Penhallow, of McGill University, on Cretaceous and Tertiary plants, possessed special interest from the fact that they represented a continuation of the paleobotanical work carried on for so many years by the late Sir William Dawson. Among the material collected by the latter were many plants which, at the time of his death, had not been studied, or if so, but very casually, and Professor Penhallow has since that time devoted special attention to their critical examination. Plants from three localities form the subject of the present papers—Cretaceous plants from Vancouver and Queen Charlotte Islands, Tertiary plants from the Red Deer River, N. W. T., and also from the Horse-fly River, B. C. In each case the plants confirm previous testimony as to the age of the formation. From the Lower Cretaceous of Skidegate Inlet, Queen Charlotte Islands, there were obtained fragments of a fern which permitted the almost complete restoration of an *Osmunda* closely allied in most respects to the type of *O. Claytoniana,* though probably about seven times as large. In a few respects the internal structure showed it to approach the type of *Todea,* so that it may probably be taken as representing an intermediate form. *Ginkgo pusilla* and *Sequoia Langsdorfi,* previously known only through foliage and fruit, have now been recognized through the structure of the stem. In the collection from the Red Deer River, two new forms appear, and are unquestionably to be referred to the existing genera *Clintonia* and *Maianthemum,* as the foliage is identical in all essential respects. In the Miocene of the Horse-fly River, there was found the wood of a *Pseudotsuga,* which appears to be the first material of the kind recorded. The remainder of the material embraces well-known species of the Cretaceous and Tertiary formations.

Dr. Wm. Saunders, Director of the Central Experimental Farm, Ottawa, gave a striking illustration of the progress that is being made in introducing fruit plants into the Northwest. A hardy Siberian apple, which bears a fruit little larger than an Ontario haw, had been crossed with the Ontario apple. The result was the production of a fruit about an inch in diameter. About four hundred of these had been crossed, and last year they had thirty trees, and this year will have about seventy, bearing fruit. They retain the hardiness of the Siberian apple, but the more they are crossed the nearer the product comes to the Ontario fruit. Results of experiments in crossing English and American currants and gooseberries, plums and cherries with hardier varieties of these plants have not in all cases been successful, but enough has been accomplished to show that hardy varieties of Ontario fruits may be produced in the Canadian Northwest, which in addition to becoming the greatest wheat-producing region in the world, will also be known for its fruit products.

A paper on the botany of northern New Brunswick was read by Dr. G. U. Hay, in which was noted the large number of bor-

eal species found on the Restigouche River in close proximity to those of a more southern or New England type found along that river and on the upper St. John.

Dr. A. H. MacKay, Superintendent of Education for Nova Scotia, gave the results of a series of phenological observations carried on by the teachers and pupils of the schools in that province, one important object of which is the encouragement and stimulus given to 'nature study.'

The results of a series of interesting experiments, noting the behavior of blind animals, were given by Professor Wesley Mills, of McGill University; and Professor B. J. Harrington, of the same University, read an appreciative sketch of the life and work of the late Dr. Geo. M. Dawson.

The officers of the Royal Society for the current year are:

President, Sir James Grant, Ottawa; *Vice-President*, Lt.-Col. G. T. Dennison, Toronto; *Secretary*, Sir John Bourinot, Ottawa; *Treasurer*, Dr. Jas. Fletcher, Ottawa.

An excursion to Niagara Falls, of which about thirty members of the Society—chiefly scientists—availed themselves, was given by the citizens of Toronto. The party visited the works of the Canadian Power Company, whose guests they were for a day; and also were allowed to inspect the plant of the Niagara Falls Power Company on the American side, a favor which was greatly appreciated. G. U. Hay.

St. John, N. B.

SECTION OF THE MATHEMATICAL, PHYSICAL AND CHEMICAL SCIENCES.

By special invitation the annual meeting of the Royal Society of Canada was held at Toronto, in the buildings of the University, on May 26–29. The sessions were largely attended, and the cool weather contributed to the success of the excursion to Niagara Falls (where the members were guests of the Canadian Niagara Power Co.) and of the trip along the lake shore to examine the interglacial deposits east of Scarborough.

The third Section (Mathematical, Physical and Chemical Sciences) met in the large physical lecture room, the President, Professor R. F. Ruttan, M.D., C.M., in the chair. 'Dalton and the Theory of Atoms' formed the subject of the President's address, and the reading of papers was diversified by a debate on the 'Existence of Particles Smaller than Atoms.' Professor Rutherford gave an account of the growth of the electron theory, and showed how the masses and velocities assigned to the hypothetical 'carriers' had been arrived at. Dr. J. C. McLennan exhibited a number of experiments illustrative of the facts on which the theory is based. Professor Lash Miller discussed the advantages and disadvantages of corpuscular theories in general, showing that they were impossible to prove and nearly as impossible to disprove, and Professor Cox spoke of the recent extension of the theory to cosmical phenomena. Professors Goodwin, Baker, Walker and Ruttan also took part in an animated discussion.

At the close of the sessions, Dr. J. C. Glashan, of Ottawa, and Professor H. T. Barnes, of Montreal, were elected members of the Section, and Professor M. Berthelot, of Paris, a corresponding member of the Society.

The following papers were read before Section 3:

MATHEMATICS.

On the Correlation of the Curve of the Second Order and the Sheaf of Rays of the Second Order in Geometry of Position: Professor A. Baker.

Beginning with the curve of the second order, which may be considered to be defined by five points, tangents are constructed at these five points; and viewing