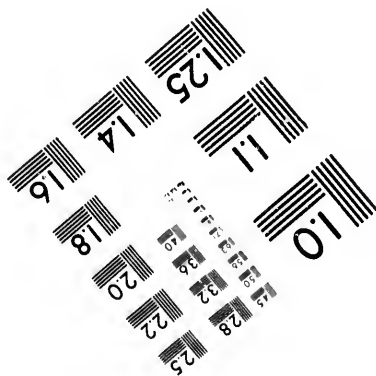
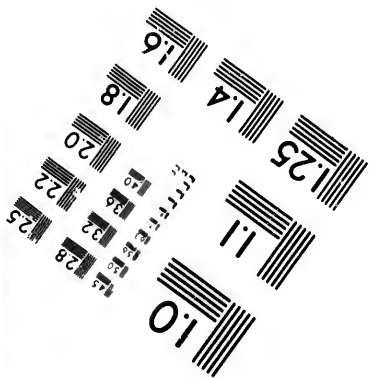
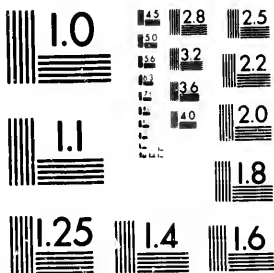


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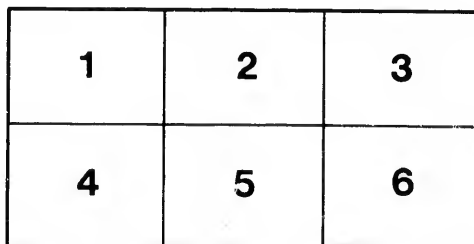
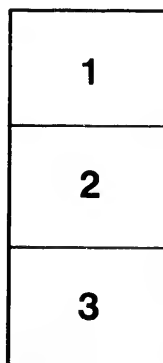
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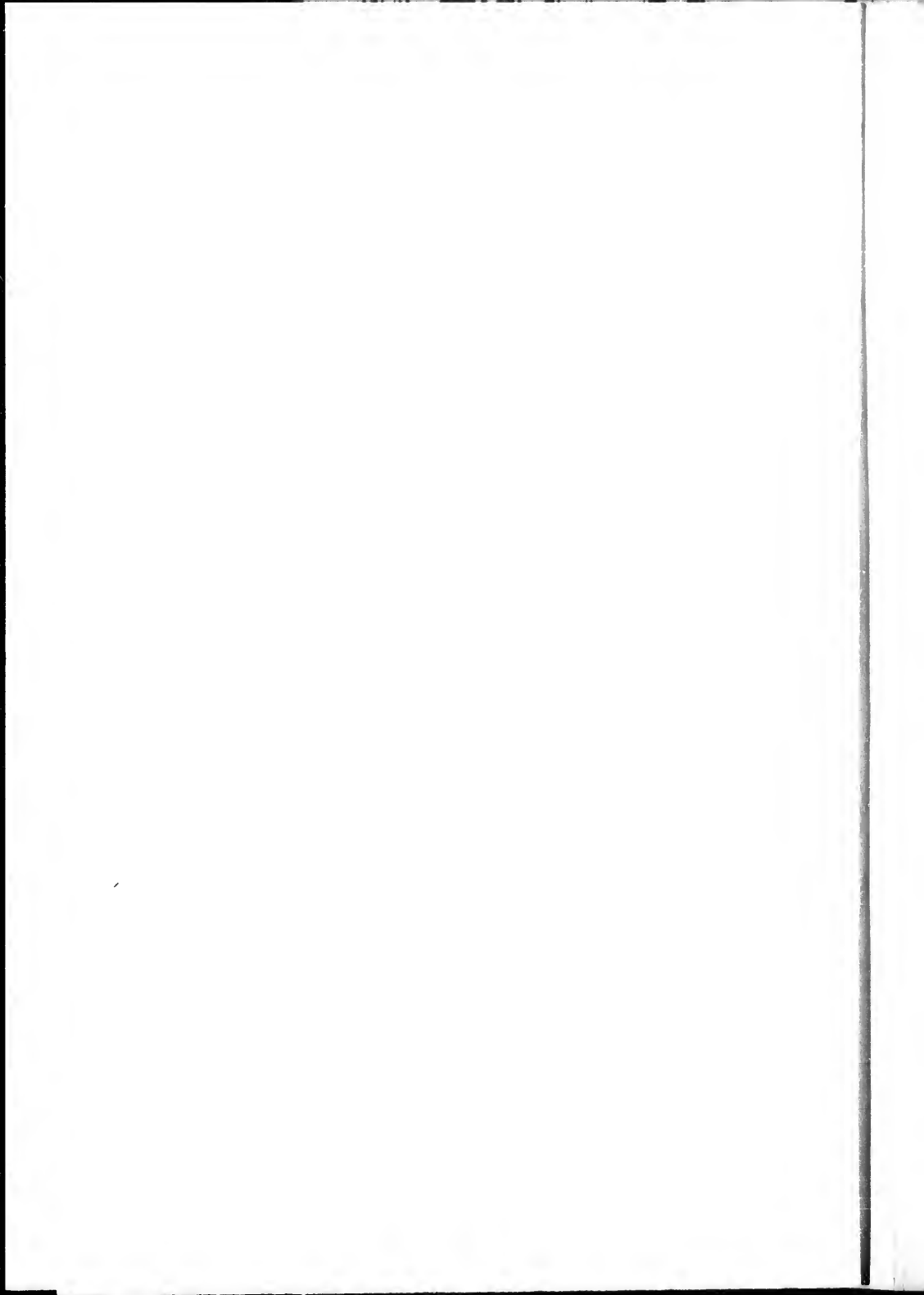
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# A LECTURE

ON

## The Progress of Science in Canada,

BY

HENRY T. BOVEY, M. A., M. I., M. E., A. M., I. C. E., &c.

*Dean of the Faculty of Applied Science, McGill University,*

MONTREAL.

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(Delivered under the auspices of the St. Paul's Church Y. M. C. A.,  
February 22nd, 1886.)

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“MONTREAL HERALD” REPORT.



# The Progress of Science in Canada.

A LECTURE DELIVERED BY

PROF. HENRY T. BOVEY, M. A., M. I., M. E., Etc.,

TO THE ST. PAUL'S Y. M. C. A.,

On Monday, February 22nd, 1886.

When I was invited to give a lecture on the subject of the Progress of Science in Canada, I must confess that I undertook the task with considerable hesitation. My general impression was that science in Canada was much like the country itself—a large area with a very sparse population. On more mature reflection, however, it appeared that there were some good reasons for studying the subject, apart from the question of giving one more aspect of the general view of Canada which this winter's course of lectures is designed to supply.

In the first place it seems as if there is a natural tendency to undervalue the greatness which lies at our doors, either in time or place. As Tennyson says:—

The past will always win  
A glory from its being far;  
And orb into the perfect star  
We saw not when we moved therein.

It is, therefore, well now and then *resolutely* to turn our eyes on the near.

Again, Science in this country is yet in its infancy. Some day, when it has perhaps developed into a brawny giant, men may look back and ask about its early character and about the influences that moulded its youth. It is not in our hands to supply the breath of genius but we can, so to speak, give the air to breathe and scope to develop. We can, by judicious encouragement, by timely help, or at least by sympathetic appreciation, do much to quicken the growth of science in our country. In this sense, we are all the makers of history, and may possibly *make it better* after an intelligent consideration of our duties in this respect. If we look over what has been done in the past and what is being done in the present, we shall be in the right road to progress in the future. With this aim I propose to be your cicero in this evening in a journey through Canadian science, and if I should inadvertently have

omitted any name which should be memorable, I trust the omission will be both forgiven and corrected.

Naturally I commence with those sciences which hitherto seem to have attracted the greatest attention, and in which by far the most valuable and profound work has been done—I mean the sciences of

GEOLOGY, CHEMISTRY, AND MINERALOGY.

Their history in Canada is closely allied with that of the Geological Survey. It is true that several excellent papers dealing with questions of local Canadian geology and mineralogy had appeared previous to the establishment of the Survey, and I would ask your attention for a few moments to a consideration of the most important. Of especial value were the contributions of Dr. J. J. Bigsbee, Secretary to the Boundary Commissioners under the Treaty of Ghent, who died only five years ago at the advanced age of 90. To Bigsbee must be conceded the honour of having been the veritable pioneer of Canadian geology. His investigations were conducted with skill and care, and the fullest reliance may be placed on the published accounts of his observations, which extended from Quebec to the country west of Lake Superior. He devoted much attention to the nature of the crystalline and fossiliferous rocks, upon which considerable light was subsequently thrown by Amos Eaton and by Emmons of New York, whose work, however, on this subject, can only be regarded as secondary to that of Bigsbee. Contemporaneously with Bigsbee, or about 55 years ago, Lieutenant, afterwards General, Baddeley, a thorough lover of geology, "explored the district of the Saguenay, and the peninsula of Gaspé, and was the first to publish a notice of the lower silurian limestone of Lake St. John, Bay St. Paul and Murray Bay, as well as of the existence of gold in the drift of the Eastern Townships." (Logan). In 1831 Lieut. Ingall published an important account of the mineralogical character of the country



between the St. Maurice and the Ottawa. In the same year Capt. R. H. Bonnycastle, having made a special examination of the mineralogical and geological characteristics of the Kingston district, published the results of his observations in Silliman's journal. Two years later, papers relating to Canadian geology and of much interest were communicated to the Literary and Historical Society of Quebec and to the Geological Society of London, Eng., by Lieut., afterwards Admiral Bayfield. We cannot leave these early workers in the field of Canadian science without a reference to H. D. Sewell, M.A., of Quebec, who made a study of the geological nature of the country in the neighborhood of that city, and to the valuable mineral collections of Dr. Holmes, of Montreal, a most patient and meritorious worker, and of Dr. Wilson of Perth, Holmes' collection now forming part of the Redpath Museum. Although, as will appear from the preceding remarks, good geological work had already been done, still it was of a very diffuse kind, the observations extending over vast regions, and little if anything was known of the age or distribution of the various formations. It was, therefore, soon recognized that if the country was to derive the full benefit from such work, it would have to be conducted in a more systematic and regular manner. Acting upon this belief, Dr. Rae, now well known as a distinguished Arctic explorer, in the month of January of the year 1832, began the first of those assaults on the ruling powers, which after a series of struggles, continued at intervals for nearly 10 years, resulted in the establishment of the Geological Survey of Canada. Rae's petition for "pecuniary assistance to prosecute a geological and statistical survey of the Province," met with the fate so common to almost all first petitions—it was unsuccessful. In the following December a petition similar in its desires and success was presented by the York Literary and Philosophical Society. The next step was taken in 1836, when a committee was appointed by the House of Assembly to report "upon a plan for the geological survey of the Province," which report was printed but not considered. One member of the committee, Mr. R. G. Dunlop, having put his hand to the plough, was determined not to give up without a hard fight, and in the December of the same year, endeavoured, though again unsuccessfully, to introduce a bill for the geological examination of the Province. By his energetic persistence, however, he had succeeded in rousing the attention

of the House, for we find that it went into Committee of the Whole to consider the question, and that it even favoured the presentation of an address on the subject to Sir F. B. Bend, the Lieutenant-Governor. This address never reached His Excellency. Yet another effort was made by Dunlop, but in vain, and it was not until the year 1841, during the first session of Parliament after the union of the two Provinces, that the long-deferred success was at last achieved. A petition asking for aid in conducting a geological survey, strongly endorsed by the then Governor-General, Lord Sydenham, was presented by the Natural History Society of Montreal and the Literary and Historical Society of Quebec. The Government now took up the question in earnest, and made a grant of £1,500 sterling for the purpose. Lord Sydenham's sudden death threw the appointment of the first provincial geologist into the hands of his successor, Sir Charles Bagot. The appointment, as you are all well aware, fell upon a man, than whom perhaps none could have been found better fitted for the task he was to undertake

#### WILLIAM LOGAN.

Logan had already made his mark as a keen and skilled observer, a most diligent worker, and a true man of science. He had, moreover, another advantage, which is much appreciated by Canadians in general, namely, that he was himself a genuine Canadian, having been born in the city of Montreal in the year 1798. It would be impossible, within the scope of the present lecture, to give anything like a detailed account of Logan's career, and I would refer those who desire to have a better idea of the extent and importance of his labours, to Dr. Harrington's "Life of Sir Wm. Logan," a work full of interest and of valuable information, and to which I am indebted for many of the facts of the present lecture. I need hardly say that Logan's appointment in 1842 gave the utmost satisfaction, and with characteristic energy he immediately set to work. During the years of 1843 and 1844 he was occupied in exploring the Gaspé regions, but by that time the original grant of £1,500 sterling had been expended, and more than £800 sterling out of his own pocket, for Logan, on his own responsibility had hired a house as museum, office and laboratory. Respecting the museum begun in this humble manner, I may here state that it gradually increased to its present large dimensions, being now an institution worthy of the country whose geological character it represents, and a lasting monument to Logan's untiring in-

dustry. Fortunately in the critical condition of the finances to which I have referred, Logan was requested by the Government to prepare an estimate of the cost of continuing the survey. His report met with unanimous approval, and an annual grant of £2,000 sterling a year for five years was made for the purpose. In 1845 Logan explored the Upper Ottawa, and his observations in 1846 extended in the West as far as Lake Superior. His work, indeed, embraced the whole country, and was of the most laborious and varied kind. To give you anything like a complete account of his work is impossible, but you may, perhaps, obtain some idea of its magnitude and importance from the following words of Sir R. Murchison on the occasion of receiving on Logan's behalf the Wollaston gold medal: "In a very able manner he has elaborated the full and accurate succession of the most ancient rocks of the vast regions he has surveyed. . . . He has clearly separated the great series of fundamental, sedimentary, unfossiliferous rocks termed Laurentian, or Cambrian, from those Silurian rocks which, in common with all geologists of the United States until the present moment, he has placed in parallel with the lower as well as the upper Silurian of Britain and Europe. . . . The skilful manner in which he has followed out the course of these ancient Silurian deposits from their undisturbed and unbroken sequence over vast tracts in the West, to the sea-board or eastern region of North America, where they have been contorted, broken up, metamorphosed and mineralized, will doubtless be considered among his most remarkable labours. . . . His maps and sections, illustrating the structure of the Canadas, prepared in the vast wilds of that country, amidst hardships and privations unknown to European explorers, will be the imperishable records of his fame as a practical geologist." In the year 1851 Logan was elected a Fellow of the Royal Society of England, being the first Canadian who attained to that great distinction. He was also a member of many other learned societies, a D.C.L. of the universities of McGill and Lennoxville, and in the year 1856 his services to his country in the development of its natural resources, received the fitting and royal recognition of knighthood. He died in June 1871, much regretted by all who knew him, and leaving behind him a name which will ever reflect high honour on his country. His place on the survey is now filled by Dr. A. R. C. Selwyn, F. R. S., who is successfully continuing the work, ably assisted by Dr.

G. M. Dawson, already well known in the scientific world, and Prof. Bell, whose extensive explorations, so recently described to you by himself, need no further amplification from me.

In the first rank of the band of workers surrounding Logan in the early days of the survey must be placed Alexander Murray, an Englishman, who proved himself an indefatigable worker and a most valuable ally. He was subsequently appointed Director of the geological survey of Newfoundland, and has done that island inestimable service in opening out its geographical and geological capabilities. Much of the preliminary work of Logan and Murray was necessarily geographical, and in this direction it has been largely supplemented by the more recent labours of Bell and Dawson. Indeed, apart from the Arctic explorations of Rae and others, it is to the survey that we owe the greater part of our present geographical knowledge. There are many others, however, who have achieved some degree of success as geographers, and especially deserving of mention are Col. Rhodes and J. Douglas of Quebec.

It was in the year 1841 that Logan, when examining the coal fields of Pictou, first met

SIR WM. DAWSON,

who was then commencing those researches in the geology of Nova Scotia which were to be the precursors of a most brilliant career, and a career of which this city may be justly proud. Dawson had just returned from the University of Edinburgh, and in all probability, had his other engagements permitted, would have become a member of the survey staff, but there was other and more important work awaiting him. Logan and Dawson kept up a correspondence on matters of mutual interest until they met again in 1855, on the appointment of the latter to the Principalship of McGill College. The Principals work in Montreal is too well known to you all to need any comment from me. His important investigations in fossil botany, and the correlated forms of animal life, in general stratigraphical geology and in other departments of science, and his arduous, but eminently successful labours in the cause of education, commencing more than thirty-one years ago, when he may be said to have aroused the University from a comatose state into new and vigorous life, have won for him not only the distinction of being a fellow of the Royal Society of England, not only a well deserved knighthood, not only the more recent honour accompanying his election as President of the British Association for the

Advancement of Science, but have also earned for him the lasting gratitude and respect of those of his countrymen who have learned the value of such work. Any notice of Sir Wm. Dawson would be incomplete without reference to that discovery, now of world-wide fame, and particular interest, relating, as it does, to the earliest date of organic life on this globe. From a careful and elaborate study of the chemical characteristics of the Laurentian rocks, Dr. T. Sterry Hunt, in 1858, was led to propound the hypothesis that organic life had existed in the remote period which they represent. Nothing definite was advanced in support of this hypothesis until the year 1864, when the proof was discovered by Dr. Dawson in certain fragments of rocks from the neighborhood of Grenville, on the Ottawa. Upon subjecting these to microscopical examination the form of a large specimen of Rhizopod, belonging to the Foraminifera group could be distinctly traced. To the new fossil Dawson gave the name of Eozoon Canadense, and his conclusions respecting its structure and organic nature are now generally accepted.

Forty years ago

T. STERRY HUNT,

then a young man, was selected to fill the post of chemist and mineralogist to the survey. Although American born, I think Hunt may be justly claimed as a Canadian, since he has spent the greater part of his life in this country, and in it his researches have been chiefly carried on. His important investigations and excellent work soon won for him a European as well as an American reputation, in evidence of which I may remind you that he has been elected a Fellow of the Royal Society of England, has been made an Honorary L.L.D. of the University of Cambridge, and has been presented with the Cross of the Legion of Honor. It will give you a better idea of the extent and variety of his labors if I run over the headings of his new book now in the press, in which he may be said to have gathered up much of his life's study. They are as follows:—

Nature in Thought and Language.

The Order of the Natural Sciences.

The Chemical and Geological Relations of the Atmosphere.

Celestial Chemistry From the Time of Newton.

The Origin of Crystalline Rocks, with a Statement of the Crystalline Hypothesis.

The Geognosy of Crystalline Rocks.

A Natural System in Mineralogy, with a Classification of Native Silicates.

The History of some Cambrian Rocks in America and Europe.

The Geological History of Serpentine, including studies of pre-cambrian rocks.

The Taconic question in Geology.

Hunt has devoted much attention to the composition of pigments, and is well known as the inventor of that greenback colour so peculiar and so difficult to imitate. In conjunction with J. Douglas, of Quebec, the old president of the Literary and Historical Society, Hunt brought out a process for the extraction of copper, which is extensively used in Sweden, Russia and Germany. Recently, again, Hunt and Douglas have devised a new process for the extraction of silver, which is at present being tested at Omaha.

For a long time Dr. Hunt was the sole investigator in chemico-geological phenomena, but now there are others in the field among whom I may mention Dr. Bernard Harrington, whose discovery of the mineral Dawsonite will, it is to be hoped, prove the earnest of still greater success.

Another interesting writer on subjects relating to mineralogy and geology is Abbe Laflamme, nor should I omit a reference to the name of James Richardson, an enthusiastic geologist long connected with the survey.

The late Professor Croft, who, from 1848 to 1878, held the Chair of Chemistry in the University of Toronto, was an original worker of great merit. It may interest you to know that he came to this country in order to fill the post which had been previously awarded to Sir Lyon Playfair. Playfair's portmanteau was packed and he was on the eve of starting for Canada, when Sir Robert Peel requested him to remain and sent him to Ireland to investigate the condition of affairs at the time of the famine.

Dr. Williamson, of Kingston, is also a good chemist and has done good work in mineralogical and geological analysis. He is an ardent lover of science, well versed in mathematics and astronomy, and even now at the advanced age of eighty, carries on his astronomical observations with the utmost vigour. This reference to astronomy may call to mind the fact that Canada was represented at the Washington conference held in 1884, for the purpose of determining the prime meridian for the civilized world, by the distinguished engineer,

SANDFORD FLEMING,

who is also well known as the prime mover in favour of Standard Time and a zealous advocate of the 1 to 24 o'clock system of reckoning time.

## MANY OTHERS

have contributed valuable information in kindred branches of science. Hannel, of Cobourg, has long given special attention to the use of the blowpipe, on which he is considered an authority. Elkanah Billings, who was appointed paleontologist to the survey in the year 1856, ably filled the post for more than 20 years, and during that time did much original work. He was succeeded by the present holder of the office, J. F. Whiteaves, whose special work has been of an eminently satisfactory character, and who is also well known as a conchologist. The man, however, who in this country has done most to promote the knowledge of conchology is the late Dr. Philip Carpenter, whose labours in this science, extending over the greater part of his life, are but slightly represented by the noble and unique collection of shells which he presented to the McGill University Museum.

In anthropology our highest authorities are perhaps Horatio Hale, who was employed as an explorer under Wilkes some forty years ago, and Dr. Wilson, of Toronto University. Prof. Campbell, of Montreal, and others have also published copious investigations on this branch of science. The largest collection in the Dominion, illustrative of anthropology, is that in the museum of the Laval University, which was made by the late Mr. Tache, a Deputy Minister of Agriculture, and brother of Archbishop Tache.

In meteorology very little has yet been done, though the patient and careful work of Prof. Carpuel, at Toronto, and Prof. McLeod, in Montreal, must be followed by good results. Of course, I cannot venture to criticise the theories of our weather prophets, which are kept profoundly secret, only to be divulged for a money consideration, and which invariably prove to be too profound for their authors.

The chief promoters of entomological research are Dr. Saunders, of London, Ontario, and Dr. Bethune, also from Upper Canada.

Biology has a most able representative in Prof. R. Ramsay Wright, of the University College, Toronto, who has contributed valuable papers on zoology, and made important investigations into the habits of parasitic animals.

In botany excellent work has been done by Prof. Lawson, of Halifax, Prof. Macoun, of Ottawa, who is now preparing a detailed list of Canadian Flora, by Messrs. Fowler, A. T. Drummond and others.

## Turning now to

THE LEARNED SOCIETIES OF THE COUNTRY, we find that the oldest of these is the Literary and Historical Society of Quebec, which was founded in 1824. As indicated by the name, this Society pays special attention to historical research, but from the first, papers relating to Canadian geology and similar subjects have been read at its meetings and published in the volumes of its transactions. Next in point of age comes the Natural History Society of Montreal, founded in the year 1832, with a view to acquire and promote a knowledge of the natural history of the country. It possesses a small geological museum, and many valuable papers have appeared in its publications, which were long issued under the name of the Canadian Naturalist, but now under the name of the Record of Science. The N. H. Society has always been ready to take active part in any scheme for the furthering of the interests of science, and was mainly instrumental in bringing about the Montreal meeting of the American Association for the Advancement of Science in the year 1857. As you all know, this has been followed by meetings in the year 1879 of the American Institute of Mining Engineers, in 1881 of the American Society of Civil Engineers, in 1882 of the American Association for the Advancement of Science for the second time, just twenty-five years after its first meeting, and, finally, by the meeting in the year 1884 of the British Association for the Advancement of Science. The great labour willingly undergone, and the large expense willingly undertaken to gather together the most distinguished men of science from all parts of Europe and America, have been amply rewarded by the brilliant and unequalled success of these meetings. They may also, I think, be taken as a proof that Canadians, although generally looked upon as a commercial people, are ever ready to do homage for the advantages which cannot but result from true scientific enquiry, and to acknowledge that the best interests of the country, both industrial and otherwise, can only be rightly served by making such enquiry as thorough and as general as possible.

The Canadian Institute of Toronto, founded in the year 1849, aims at covering wider ground than either of the above societies and embraces in its proceedings subjects from the whole range of mathematical and physical science. Many of its papers are of great value and may be found in the publication which it issues under the name of the "Canadian Journal of Science."

The Royal Society of Canada was founded only four years ago (in 1882) and met for the first time in Ottawa in the following year. Its scope is partly literary and partly scientific, and although it is yet too soon to expect from it many weighty contributions to our knowledge of literature and science, it should develop into our most important society, drawing its members, as it does, from all parts of the Dominion.

The Manitoba Historical and Scientific Society, was founded at Winnipeg in 1878, chiefly by the exertions of Prof. Bryce, and has entered upon a vigorous and useful career.

There are also other societies, as for example, the Montreal Numismatic and Antiquarian Society, the Entomological and Horticultural societies, &c., all having a laudable desire to lighten up the obscurity surrounding the subjects which they severally represent.

Before going further it may be well to consider

#### THE FACILITIES NOW OFFERED THROUGHOUT THE DOMINION

to students of these sciences.

At the University of New Brunswick Prof. L. W. Bailey has for many years lectured on geology and chemistry, but very little, if anything, of a practical nature seems to have been done in the latter.

In the Province of Nova Scotia there is a provincial museum, of a specially geological character, at Halifax, under the superintendence of Dr. Honeyman, who also lectures on geology at Dalhousie College. The chemistry at this college is taught by Dr. G. Lawson, and until recently has been mainly theoretical, but a laboratory is now fitted up and the course may be expected to prove more effective in the future.

Geology and chemistry have long formed part of the course at King's College, Windsor, and are at present taught by G. T. Kennedy, who succeeded Dr. Spencer, now Professor of Geology in the University of Missouri. Both of these gentlemen are graduates of the Science Faculty of McGill. Some degree of attention has also been paid to geology and chemistry at Acadia College, Wolfville.

The leading science institution in the Province of Ontario is the School of Practical Science, connected with the University of Toronto. Prof. Chapman, the author of much original work, has long taught the geology, and in the chair of chemistry the late Prof. Croft was suc-

ceeded by the present holder, Prof. Pike, who is assisted by Dr. Ellis. Theory is supplemented by practice in the laboratory, and the training is very thorough.

At Kingston, lectures on chemistry are given by Prof. Bain at the Military College, and by Prof. Goodwin at Queen's College. The latter succeeded Prof. Dupuis, now the Professor of Mathematics, and Dupuis' predecessor was Prof. Bell. Very little, if any time, is devoted to geology. Excellent courses in chemistry, with good laboratory work, are given by Dr. Hawnel at Victoria College, Cobourg, and by Dr. Hare at the Agricultural College, Guelph. Provision is also made for courses in natural science at Albert College, Belleville.

In the year 1856 Dr. T. S. Hunt was elected to a professorship in Laval University at Quebec; and was requested by the authorities to organize a course of natural science for that institution. The ordinary routine work was carried on by an assistant, Dr. La Rue, a clever chemist, and pupil of the celebrated Woortz, of Paris, while Hunt confined himself to a few lectures on the chemistry of plants and animals, and to a little elementary instruction in mineralogy and geology. There is also a museum connected with Laval which was arranged by Hunt, who resigned his post in the year 1862, but still holds the title of emeritus professor. The present professor is the Abbe Lathamme. The lectures on chemistry to the students of the Bishop's College Medical faculty are delivered by Messrs. J. Benrose and J. T. Donald.

In McGill College Medical Faculty chemistry was first taught by Dr. A. Holmes, then by Dr. W. Suherland, then by Dr. R. Craik, who is still an emeritus professor, and is now in the charge of Dr. G. Girdwood, assisted by Dr. A. M. Ruttan. It is only during Girdwood's professorship, that practical work has been introduced.

In the Faculty of Arts the lectures on chemistry were given by Dr. Dawson until the year 1875, except during a short interval about the year 1860 when he was relieved by Dr. T. S. Hunt. The chair of mineralogy and chemistry in the Faculties of Arts and Applied Science is now held by Dr. Bernard Harrington. Under his able superintendence practical work of the most advanced character is carried on in the laboratory, which has recently undergone extensive and long needed improvements, and has been thereby thoroughly adapted to present requirements.

You may estimate the importance of such work if you consider that upon a

correct knowledge of the principles governing meteorological and mineralogical phenomena depend in a very high degree on the proper development of the copper, iron and steel industries, and indeed of all the mineral resources of the Dominion.

Respecting geology as taught at McGill, I need only say, that this subject is Sir William Dawson's special care. Logan's appreciation of the scientific education given at McGill was emphatically demonstrated by his endowment of the Logan chair of geology and the Logan gold medal.

Nor must

#### THE ADMIRABLE UNIVERSITY MUSEUM

be forgotten while enumerating the advantages enjoyed by the modern student. Nothing, perhaps, will better illustrate the rapid advance in natural science than the growth of this collection. Thirty-one years ago, when Dr. Dawson first assumed the Principalship, one of his first queries was—"Have you anything of the nature of a museum?" He was met at first by a melancholy negative. "But stay," said our worthy secretary of that time, "I think some one did leave a bit of stone lying about the other day." That stone, which proved to be one of the fossil corals of the Monticulipora type, is still in the possession of the University, and was the veritable foundation stone of the present noble museum.

Turning, now, to

#### MEDICAL SCIENCE,

we find it represented by schools of medicine in Toronto, Kingston, Montreal, Quebec and Halifax, by the Dominion Medical Association, by provincial and city medico-surgical societies and by various college societies.

The high reputation of the McGill Medical School, based upon the excellence and breadth of the course, is mainly due to the fact that the members of the Faculty are not only ardent professional workers, but have obtained distinction in those subjects of which they severally have the care. Only two years ago the chair of Physiology was held by a Canadian whose Pathological researches have made his name famous on both sides of the Atlantic—I mean Dr. W. Osler. He has been succeeded by others who are successfully continuing the work, and have been enabled widely to extend it through facilities which have been provided by the private liberality of our citizens. Laboratories have been added and thoroughly equipped, so that the causes of disease and the habits of disease-carrying germs may be now studied so completely as to justify the hope of

valuable contributions in the near future to our knowledge in this branch of science. The importance of such studies has been shown by the cholera investigations of Dr. Koch, by Pasteur's world-famed inquiries into the cause and prevention of hydrophobia, and by the experiments now being carried on in London, England, to discover whether a certain outbreak of scarlet fever did not originate from a vaccine disease, pointing to a possible vaccination as the remedy.

Finally let me direct your attention for a few moments to

#### MECHANICAL SCIENCE.

Mechanical inventions of general utility have been lamentably few, although many Canadians have shown no lack of ingenuity in re-inventing patents, a characteristic by no means uncommon in other countries. The work of the late Dr. Beaumont, of Toronto, is deserving of special mention. He was born in London, Eng., in the year 1803, and came to Canada in 1841, where, according to the following extract from the *Canada Lancel*, he "invented and made for himself several surgical instruments, some of which are of great ingenuity and utility. Among others one for passing sutures in deep-seated parts [as in the operation for cleft palate] which was examined and admired by Brunel, the great engineer, and was reputed by Newman, the surgical instrument maker, to have been the origin of the Singer sewing machine." A few individuals of a sanguine nature have rejoiced in the hope that both Edison and Bell are Canadians, and that, therefore, we might fairly claim some measure of credit in their discoveries, but their hope cannot be substantiated. It is true that Edison was once a new-boy and then a telegraph operator in Ontario, and it may be that in the latter position his desire for further scientific knowledge was quickened, but the whole of his original work in electricity has been undertaken and carried on in the United States. Graham Bell was born and educated in Edinburgh, and was grown up when he came to America. His only scientific connection with Canada lies in certain telephone experiments which he was wont to continue when visiting his father at Brantford. Now, what has been done or is being done to fit men for work in mechanical science? It is not too much to say that the education provided up to the present time in experimental physics and in the higher branches of scientific engineering still leaves very much to be desired. We have schools of applied science in Toronto and Montreal,

and excellent courses of lectures on the theory of electricity, magnetism, light and heat have been established in the University of Toronto under Prof. Loudon, in McGill University under Dr. A. Johnson, who has lately taken such an active part in promoting tidal observations, in Dalhousie under Prof. Macgregor, and in Queen's College, Kingston under Prof. D. H. Marshall. These institutions, and also Laval University and the Seminary, possess some valuable apparatus, but no provision has been made for practical manipulation, except, perhaps, in the case of the University of Toronto, where, during the past year, a practical course has been introduced, which will, I sincerely hope, prove the dawn of a brighter future. This almost entire absence of laboratory and what might be called shop-work, very seriously hampers the first endeavours of those who have any leanings towards original research, and often results in hopeless discouragement. The professor also labours under grave disadvantages in having no means of giving his students a real education as opposed to mere instruction. There is no remedy for this state of things except by the building up of properly equipped laboratories. A more indirect, but grave, difficulty springs from the same source, which has already given rise to some controversy. It is often maintained that Canadians should have the first claim on all educational posts in this country, and *ceteris paribus*, I am myself of the same opinion, as they are undoubtedly better acquainted with the genius of the country and are consequently better able to avoid the many difficulties which beset the path of a foreigner. But, it would be utterly impossible at

once to do justice to the interests of the student and to give the charge of any of the branches of science we are now specially considering to one who has merely received a theoretic education.

#### AN ALL-ESSENTIAL REQUISITE

in a teacher of science is that he should himself have been trained in the experimental school. That we have among us men well qualified by nature to undertake the work cannot be doubted when we see them sought after to fill chairs in other departments. But a little time since Dr. Osler was selected to fill an important post in the University of Philadelphia, and still more recently Cornell has filled her chair of philosophy by borrowing a man from Dalhousie. In one respect the choice of these men is a matter of pardonable pride, in another it cannot but be regretted that while yet perhaps in the first stage of development, they are lost to this country, which sorely needs them all. I have tried to give some idea of Canadian workers and their work, but although it is well not to overlook the near in admiring the far off, and although it may be well also occasionally, and for the sake of encouraging a wise emulation, to look at science from a *national* point of view, yet it must never be forgotten that the true significance of the life work of such men as we have been considering lies, not in their representation of this country or that, but in the fact that they form one detachment of the great army, which in every country of the world is endeavouring, with more or less success, to hold the citadels of truth and push ever farther back the confines of ignorance and error.

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