SOME NOVA SCOTIAN SCIENTISTS

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WE Nova Scotians are a proud race. True, we have some cause for pride. Our ships and seafaring men have made the Bluenose name feared on every sea; our statesmen have sat high in the councils of the nation; our scholars have been known and honoured throughout the world. Most of us cherish the conviction, modestly unexpressed, that Nova Scotian brains are just a little better than other sorts of brains. It comes, then, as a shock to us to be reminded that our province has given the world no great men of science—none, that is, of the very first rank. Mathematics, physics, astronomy, chemistry, geology, biology—all these have their great heroic names, and they are not the names of Nova Scotians. But we have no cause for shame. The genius is a prodigy, a freak of nature; and if by chance no such intellectual monster has sprung from Nova Scotian soil, we can still hold our heads up, and boast of the high tides on the Bay of Fundy.

We are not, indeed, reduced so far. For if our countrymen have not been the great architects of the edifice of science, they have at least been honest labourers at its building. In almost the earliest days, when there was little chance that their work would be recognized and none that it would be profitable, there were intellectual Nova Scotians who devoted much of their time and energy to scientific work. In later years our colleges have scattered over the continent able and industrious workers in every branch of knowledge. Nova Scotian scientists have been able to settle unaided the scientific problems peculiar to Nova Scotia; and a few of them have won international fame.

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The history of Nova Scotia, short as it is, goes back to the dark ages of science, when learning meant classical learning, and the sciences were a jumble of wild theories and half-facts thrown together under the name of "natural philosophy". In 1749, when Halifax was founded and the province became definitely British, the memory of Newton was still fresh, and the potency of his ideas was hardly recognized. Before Lavoisier had forged alchemy into chemistry, before Watt's engine made science a reality to the masses, the Loyalists had come to the Valley and the Scotsmen

to Pictou. King's University is older than the atomic theory; Dalhousie is earlier than Darwinism by forty years. Thus the history of Nova Scotian science naturally mirrors the whole course of the modern quest for knowledge. And the reflection is an astonishingly clear one. The earliest settlers, of course, with savages to fight and forests to hew down, had neither the time nor the inclination for scientific pursuits. In modern times, again, science has been fostered primarily by the universities, in which familiarity with current thought is a matter both of business and of pride. But in that interesting interval, including, say, the years between 1800 and 1860, the only scientists were amateurs, military and professional men whose concern was the study of nature around them. They were remarkably clever and remarkably up-to-date.

The first genuinely Nova Scotian science was born of the mining industry. Coal had been discovered in Pictou County in 1798, and mining on the large scale was begun there in 1824; the Cape Breton and Cumberland beds were first developed somewhat later. The English company in charge early realized that good policy demanded not only the economical development of known seams, but the search for new and richer ones. Two especially of the men sent out from England were capable geologists. These were Richard Brown and Henry Poole. Brown, as manager of the Sydney coalfields, explored in a general way a good part of the rock formations both of Cape Breton and of the mainland. In 1829 he contributed to Haliburton's *Historical and Statistical Account of Nova Scotia* a sketch of the geology of the province, the very first treatise on the subject to be published. Poole was, for some years in the sixties, manager of the collieries at Stellarton. His hobby was palaeontology, and he contributed several papers on Pictou County fossils to the newly organized Nova Scotia Institute of Science. It is worthy of note that the first railway to be operated in Canada was the six-mile line between the Stellarton mines and the landing ground on Pictou Harbour.

It was Abraham Gesner, an Annapolis County doctor with a taste for geology, who wrote, in the late thirties, the first full length scientific book published in the province, a treatise on Nova Scotian geology. A little later he performed a similar service for New Brunswick. Gesner was not a great theorist, but he possessed a sound practical knowledge of minerals, and he was one of the first to recognize the variety and wealth of Nova Scotian ore deposits. He was the first authority on the gold ores of the province, and he was very optimistic about their future, going so far as to predict

that the Nova Scotian lodes would rival in wealth those of California and Australia.

While Gesner and Brown were laying the foundations of the province's geological lore, a remarkable man in Pictou was experimenting in a very different field. No account of Nova Scotian science would be complete which did not mention Thomas McCulloch, minister, physician, journalist, educationist and reformer; he stands at the head of that amazing movement which turned Pictou County from a primitive backwoods settlement into a stronghold of solid learning. Born in 1776, McCulloch came to Pictou in 1803, as an untried young minister, known in Scotland for his splendid scholastic attainments. He could scarcely have found himself in less congenial surroundings. His charges, to be sure, were religious enough, so religious indeed as to discourage any display of evangelical zeal on the part of their pastor. But they were stingy; the minister was often sternly admonished, when he tried to collect some of his stipend, to trust for his sustenance, like Elijah, to God. They were parochially minded, worrying little about the open infringement of their rights by the governing clique at Halifax. Worst of all, they were ignorant, and likely to remain so. "Beyond what enabled children to read the Bible, write a letter, or calculate a bargain," says McCulloch's son and biographer, "parents seemed to regard education as costing more than it was worth." Facilities for a better sort of education, even if the Pictonians had wanted to avail themselves of such, were entirely lacking.

All these things McCulloch set himself to fight. His weapons of war he seized from his neighbours—their religion, their ambition, and most of all, their latent Highland pride. Their sons, he told them, would be ministers, their purses would be filled, the stranglehold of Halifax domination would be broken—if they called education to their aid. His fervour struck home. Soon he had a school, and then, in 1816, a college, modestly named an academy. Here McCulloch planted new aspirations in the mind of many a young Scot. But his schemes had always strong opposition. The provincial Government would not support the little college, and at time even actively opposed it. The attitude of Presbyterians throughout the province was scarcely more favourable. McCulloch boarded many of his pupils free of charge at his own home, and spent much of his scanty salary on books and supplies for the school.

His main ambition was to train a native ministry. But his scholarly interests went far beyond the bounds of theology.

He had an acquaintance with the various sciences as thorough, perhaps, as that of any man in the province. Not only was "natural philosophy" given a prominent place on the curriculum of Pictou Academy, but laboratory training was made a regular part of the course, a procedure entirely unheard of at that time. Seventy years later, only honour students at Dalhousie were given any opportunity of experimenting for themselves; and Dalhousie was not considered backward in science. The equipment at the academy, indeed, was pitifully meagre. But McCulloch kept adding to it continually, eking out his scanty funds by purchasing nothing that he could possibly construct himself. Besides teaching and directing the academy, he was during all this time preaching twice every Sunday, and contributing to the local journals articles of such wit and ability that the *Edinburgh* itself was anxious to secure him as a regular contributor.

His sons, who were now growing up, inherited their father's scientific enthusiasm, and among them the McCulloch family collected and arranged what was then without doubt the finest museum of natural history in the colonies. Audubon saw it in 1833, and was astonished. It contained many specimens that were rare then, and would be priceless to-day. Unfortunately, the collection had to be broken up and sold to meet the financial demands of the academy. In 1836, McCulloch founded in connection with his academy classes a "Philosophical Society," the first purely scientific society in British North America. He writes of it as follows to a friend in Scotland:

> The Synod contains a few spirited young brethren, who as yet have been cramped, and I may say borne down by others, but their dissatisfaction with the state of our affairs is becoming prominent, and may perhaps prove the commencement of better times. As an evidence of the above, I may mention that four of them formed themselves into a Society for the purpose of establishing the National Philosophy class; in this they were joined by a number of their fellow students, and they now have the class in operation under their own management. I lecture to them without emolument, and the Society's funds are expended upon an operator, and incidental expenses. The course includes chemistry, and as it is illustrated by a splendid series of experiments, I am even with an assistant subjected to grievous fatigue. Our apparatus is very defective, and that is a source of much labour. Besides, in many cases, we must manufacture the materials with which experiments are made. What would cost only a few pence in Britain costs us the labour of days.

One of the first papers read in the little society bore the ambitious title, "On the Structure and History of the Earth,"

and it was written by a young protégé of Dr. McCulloch's named William Dawson.

At about this time, partly through sickness in his family, but more through his excessive liberality, McCulloch found himself deeply in debt, with no prospects of financial relief. He had delivered a successful series of popular scientific lectures in Pictou, and the idea struck him that similar courses in other centres might be to the advantage both of his pecuniary situation and of the academy's repute. He tells the story himself:

> After much foreboding, conjecture, and hesitation, I came to the conclusion that necessity has no law, and that nothing else would relieve me from my encumbrances, and enable me to carry on. I saw that to Halifax I must go, and to Halifax I went. It was not so bad as going to be hanged, but I found it by no means comfortable. I was going to the very focus of power, and enmity, and my unsubdued spirit felt that I was going because I could not stay at home. In Halifax there had never been any public exhibitions but of players and showmen, and I really felt as if I belonged to a vagabond race. A bear and a few dancing dogs would have been suitable companions to the mood in which I entered our gay and dissipated metropolis....At the solicitations of Councillors, the Admiral, Commissary-General, and other grandees who dine after six, I lectured three days a week at three o'clock. On the alternate days I lectured to another class at eight in the evening. In the compass of twenty-one lectures I managed to squeeze together a mass of the finest experiments in philosophy, and left my audience as eager as at the commencement of the course. I had with me my two sons, Michael and David, who could operate as well as myself. We had those attending us who had studied at Oxford, London and Edinburgh, and they all agreed that they had never seen experiments more dexterously performed. In the evenings we were crowded to excess, and were obliged to refuse admittance. At the same time it was generally understood that eagerness for money had not kept pace with my wish to gratify friends, and such a kindly feeling pervaded both my classes that my lectures were supposed to have done more good to the academy than anything that previously happened. They brought me into contact with numbers in the higher circles to whom I had been sadly misrepresented, and who did not find me that arrogant and violent man they had heard me to be.....I must therefore tell you that without being puffed up in Halifax I was glad to get away from it, and now, after paying a few pressing encumbrances, I am again facing Presbyterian hardship.

In subsequent years McCulloch gave an enlarged and improved course to classes in Halifax, Charlottetown, Saint John, and Newcastle. Even in these populous centres, ignorance was rife. McCulloch's son, James, writes home disgustedly from Newcastle:

"Every fellow thinks himself so wise that he has no need to be taught. They look on us as strolling play-actors, and many think our experiments were sleight-of-hand. The other night, when we were trying the experiment of the Magdeburg bells, one man whispered to another, 'Look at them soldering it with grease.' When I return I will be able to read you a small book of anecdotes on this land." Things like this must have been discouraging to McCulloch. But there can be no doubt that the lectures did much good, both by stimulating interest in science, and by showing what could be done even in a small local institution.

In 1838 the repeated attacks of its enemies were successful in reducing the academy to a mere grammar school, and its principal was transferred, along with its Government grant, to the dormant university founded by Lord Dalhousie. This was a promotion for McCulloch, but not one to give him much joy, for it meant the interruption, if not the end, of his dearest project, the training at home of a native ministry. For five more years in Halifax he organized and taught and battled the bureaucracy. He died in 1843. His influence still lives.

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John William Dawson was born in Pictou town in 1820. He was a first generation Pictonian, the son of a self-educated Lowlander who had obtained some measure of prosperity in the little trading town. Both the elder Dawson and his wife were deeply pious people, and they were full of ambition for their son. Young William was studious enough to please them, and religious to a degree remarkable in that most religious of towns. He seems, indeed, to have been something of a prig. He did not associate with his schoolfellows, but spent his spare time in reading, or in roaming up and down the countryside in search of specimens for his collections. Something of this quality stayed with him all through life. To many his piety seemed obtrusive. But it was a colorful piety, and all the man's strength of character was behind it.

Nowhere else, perhaps, in the province could a boy grow up with scientific aspirations. But Pictou was McCulloch's town, and McCulloch was in his prime during Dawson's youth. When the young man passed from the grammar school and put on the red gown of the little college, he was able to work for himself in a physical laboratory, to set up his own chemical apparatus, and to acquire from one of the principal's sons the rudiments of taxidermy and practical zoology. Geology, though, was Dawson's first love. At an age when the modern youngster is preserving cigarette cards

and soap-wrappers, Dawson was collecting fossils. At first, naturally, he had no idea of the significance of the leaf-like figures traced in the fragments of slate, but his parents suggested that he show his trophies to Dr. McCulloch. The great man enlightened him, encouraged him, and consented to accept some of the specimens for the college museum. Thenceforward Dawson was a geologist. He managed to get hold of some treatises on the subject, and further profited by making the acquaintance of Brown and Gesner, who were then writing on Nova Scotian geology. Another friendship contracted during his youth was that with Joseph Howe, who was to exercise some influence on his later life. While Dawson was still a student, he began to spend his vacations on expeditions to distant parts of the province—no easy task in those days—to see the remarkable formations which had already drawn the attention of geologists to Nova Scotia.

In 1839 Dawson graduated from the seminary. He had by this time a fair knowledge of geology, acquired entirely from reading and observation. It was now time for him to choose a career. The ministry was the normal fate of the lad of parts in Pictou County, and this, no doubt, was his parent's ambition for him. But Dawson decided that it was his duty to remain at home, to take over his father's business, and with all this to contribute what he could to the intellectual and religious life of the province. It was decided, however, that he should first have a session in Edinburgh University, where a comprehensive course was offered in geology.

McCulloch had sent some of his theological students to Scotland, but it was something new for a Nova Scotian to go abroad for a scientific education. Apparently the idea was equally novel in Great Britain. On arriving in Newcastle, he relates: "I was introduced to a debating club of young men, and having taken some little part in the discussion, was complimented by a member on my speaking English so well. Possibly he supposed that my native tongue was Chippewa or Micmac! This ignorance was an intimation of the insignificance of my own country that did not pass unnoticed."

The year in Edinburgh brought Dawson new information and other points of view. Also, he met Margaret Mercer, whom he married in 1847, when he returned to complete his education. Dawson's wedded life was ideally happy. Two sons born of this union became successful in science, George Dawson as a geologist, and William Dawson as an engineer. Both of these men were born in Pictou.

In the interval spent at home, Dawson became the friend and co-worker of Sir. Charles Lyell, perhaps the greatest of all geologists. Lyell grew very interested in the young man, and to his interest Dawson owed much not only of his education, but of the rapidity with which he was recognized by the scientific world.

He returned from his second year in Scotland to find his friend Howe in the midst of a new reform, this time the reform of the schools. The province's educational system was, indeed, scarcely a system at all. There was no provision in the statutes for the training of teachers, for compulsory attendance, or for financial support of the school. Howe controlled the Assembly, and believed that he could make the necessary changes in the law; his great need was a Superintendent of Education to enforce the new system. He sounded Dawson, and knew that he had found his man.

For three years Dawson worked unremittingly at this task. Howe wanted agriculture taught in the schools; Dawson absorbed all available information on the subject, carefully considered local conditions, and compiled the book required, *Contributions toward The Improvement of Agriculture.* A text-book was needed treating the geography and natural history of the province; Dawson wrote that too. During his term of office he traversed the province time after time, explaining the new law, making criticisms, and offering suggestions. When he resigned the position, he had laid the foundations of a sound educational system. But with all this, he found time to complete what was really a one-man geological survey of the province. He published his findings in 1855, under the title *Acadian Geology.*

The *Acadian Geology* was a concise and brilliant treatise. The field which Dawson had surveyed was a large and complex one, and it had been only scantily touched by his predecessors. Dawson settled the main problems for all time, and in so doing illustrated what had been one of the vexed general problems of the science, namely, the inter-relations of the various carboniferous strata. He had one brilliant stroke of luck during these researches, when he found in the coal beds of Joggins the remains of an early reptile Dendrerpeton. This was a revolutionary discovery, for forms so high as reptiles had not been known to exist until after the carboniferous age. The *Acadian Geology* was published in Edinburgh, and it immediately won for its author a place in the front rank of geologists.

1855 was an eventful year in Dawson's life. The year before Edward Forbes, Professor of Natural History at Edinburgh, had

died, and Dawson was informed that he was being strongly recommended for the vacancy by Sir Charles Lyell and other influential men. His hopes rose high, for it was a post of great honour and opportunity. But the chair embraced both geology and biology; and just as Dawson was about to sail for Scotland to present his case in person, he received word that the appointment of Dr. Allison, the candidate of the biological party, had been rushed through.

Almost at the same time as this disappointing news, came another message. This was from the governors of a small and infirm institution in Montreal, named McGill University, whose principalship he was now being asked to accept. The offer was not a very alluring one; the position was likely to involve much purely educational work, and it would remove him farther from his beloved coal-fields. But the idea of a change of residence had become familiar to him, and finally he decided to accept.

Dawson remained at McGill for thirty-seven years. His work there is history. The university as he found it consisted of a few dozen students, three or four professors, and a single dilapidated building standing in a pasture. He left McGill the most prosperous of Canadian universities. Dawson and the university made each other mutually famous. As one commentator says: "To the world at large, which loves to crystallize its ideas round a man, McGill was Sir William Dawson, and Sir William Dawson was McGill." For years he was not only principal, but professor, business manager, normal school teacher, and in the earliest days even caretaker of the campus. In some way he still found time for research and writing.

Dawson was thoroughly at home only in a contest. The publication in 1859 of Darwin's *Origin of Species* gave him scope for the exercise of his powers. During the next ten years he wrote a long succession of books and articles, in which he endeavoured to prove that variation of species was contrary not only to the Sacred Word, but to the record of the rocks as well. These were able writings, sometimes perhaps unfair, but certainly neither less fair nor less able than the bulk of contemporary literature on the opposite side. Dawson readily admitted the antiquity of the world, but he could never be persuaded that species-distinctions are not unvarying and absolute. Thus his views, considered very heterodox by the theologians of his youth, give him in his later days the name of conservative and reactionary. Dawson was indeed a stiff-necked Pictonian. There seems to be no record that he ever changed his views on any subject whatever.

His later scientific work was concerned almost entirely with palaeontology. It was his aim so to catalogue the organic remains of each type of rock that any formation would be identified by an examination of its fossils. This was a mighty undertaking for a man with so many other pressing interests, but the work was very largely successful, especially that part which dealt with the older Canadian rocks. It was during this period that he discovered, imbedded in Laurentian granite, what appeared to be the skeleton of a very primitive animal of the coral type. Dawson suggested that this was really so, and that the animal, which he called *Eozoon Canadense,* was the oldest form of life yet known to science. Unfortunately, the evidence for Eozoon did not convince the majority of scientists, who considered that the fossil was merely a concretion of purely inorganic origin. "It was assailed", Dawson writes, "from various quarters, with as much bitterness as if this old fossil had been a personal enemy." Modern opinion is inclined to side with the detractors of Eozoon. As a theorist, indeed, Dawson mixed caution and daring. Although he accepted Eozoon as genuine on grounds now believed to be very slender, he was never convinced by the evidence for such great hypotheses as the glacial theory or the theory of organic evolution.

Dawson's later years were filled with fame and honour, both in the city for which he had done so much and in international scientific circles. In 1881 he was made a C.M.G. In 1882 he became the first president of the Royal Society of Canada. In the same year, he was elected President of the American Association for The Advancement of Science, and four years later, President of the similar British Association, a dual distinction which has been granted to no other scientist. In 1884 he was knighted by Queen Victoria. His work continued uninterrupted far into his old age. It was not until 1892 that his health finally gave way, and he was forced to give up his university duties. Even then he could not resign himself to idleness. He busied himself with lecturing, reading, and writing his autobiography.

The end came in 1899. A few days before, he had begun "with failing hand and wearied brain" to pen an essay on "The Gold of Ophir."

Sir William Dawson was the greatest of Nova Scotian scientific men. His executive ability, indeed, and the native force of his character, have perhaps preserved his name rather as that of the great president than as that of the great geologist. An unflagging sense of duty, and an adaptability of mind that could turn itself to any-

thing, made him successful in whatever he undertook. He was an epitome of the Nova Scotian virtues.

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It is now time to speak of an organization which for almost ninety years has been intimately associated with scientific endeavours in this province. The Nova Scotia Institute of Science was founded in 1863 by a group of Halifax gentlemen. It was therefore preceded some thirty years by the Philosophical Society at Pictou. But its character and aims were from the beginning quite different from those of McCulloch's little study group. The members of the Institute were men of general culture, well acquainted with the leading facts of science then known, though few of them were specialists in any branch of scientific enquiry. Their aim was less to keep in touch with new discoveries abroad, than to form a channel whereby the results of their own observations could be made public.

The early *Transactions* of the Institute make interesting reading, for the contributors were at least as careful of their literary style as of their scientific accuracy. The first meeting was held at Halifax in May of 1863, with the following officers in charge: J. Matthew Jones, President; J. Bernard Gilpin, M.D., Vice-President; William Gossip, Secretary; and Captain Sylvester, Treasurer. Not inappropriately, the Institute's first paper, read by Dr. Gilpin, was an account of the habits and economic importance of the native herring. Another significant paper read at the same meeting was contributed by Dr. Gesner, and was concerned with the commercial metallurgy of gold. The precious metal had just been discovered in Nova Scotia, and a great awakening of interest in geology was the result. One still meets many an old farmer in southern Nova Scotia who can talk by the hour of faults and outcrops and anticlines.

For the first twenty years the papers contributed deal almost exclusively with the plants, animals, and rock formations of Nova Scotia, with an occasional essay on meteorology and ethnology. Most of the ethnological essays are composed of interesting but not very scientific tales about the local Indians. For years the *Transactions* do not contain a single paper dealing with physics or chemistry. This was perhaps to be expected, for the universities were still in financial distress, and complicated experiments were beyond private means.

But these amateur scientists were good observers, and they knew their Latin terminology and their geological formations very

well. They cautiously avoided much discussion of the newer theories. When the Institute was organized, the *Origin of Species* had been in print for four years, but the *Transactions* of the Institute contain no reference to it for a long time. In 1865 however, William Gossip, a Halifax printer whose hobby was geology, contributed a long paper of considerable merit, in which he endeavoured to show that the evidence for evolution drawn from fossil remains had been greatly overrated. The next sign that the controversy raging in England had not gone unnoticed in the colonies was Angus Ross's paper of 1873 in defence of the new theory. His arguments seem very nearly those of modern scientific textbooks: he must have shocked the Bishop, who was a member of the Institute, with his declaration that experiment and research should be our only guides to the history of the earth. At about this time another theorist, who deserves to be remembered for his brilliant imagination, suggested that the Micmac tongue is a survival of the primeval language spoken before the fall of Babel, and that it was consequently the speech of the Garden of Eden. Angus Ross could have informed him that this honour properly belongs to Gaelic!

With the rebirth of Dalhousie in 1879, the history of the Institute takes a new turn. Two able young men, MacGregor and Lawson, were placed in charge of the departments of physics and chemistry at the university, and MacGregor was elected President of the Institute. They immediately began to publish much of their research under the auspices of the Society; and the amateur scientists, perhaps a little diffident of talking before experts, began to take a less prominent part in its doings. In later years the history of the Institute has been closely bound up with that of scientific activity at the various colleges. Except in the successive agitations for the establishment of a technical college, it has seldom come into the public eye. Few but its members knew anything of its doings. But it has performed, and is still performing, valuable service as providing a convenient outlet for the results of research work at the universities.

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One of the men associated with the Institute of Science must be treated in greater detail. J. Gordon MacGregor was born in Halifax in 1852, the son of a Pictou County Presbyterian minister. At the age of sixteen he entered Dalhousie, where he took his degree in Arts, and where he captured every possible prize. On his graduation he left with three of his young scientific friends to

study in Europe, first at Edinburgh, afterwards at Leipzig. They were the first Nova Scotians to take a post-graduate course in Germany. MacGregor's Edinburgh teacher was the famous P. G. Tait. It must be remembered that in the colleges of MacGregor's student days natural philosophy was entirely a text-book study. The professor occasionally performed one of the classic experiments during his lecture, but regular laboratory instruction was a thing unheard-of. Tait, however, used as a special privilege to admit a few of the most promising students to his own workroom, and it was here that MacGregor got his first taste of experimental physics. In Germany, on the other hand, the experimental method of training had been widely adopted, and a generation of brilliant young scientists was arising, who were to bring great honour and wealth to the Fatherland. MacGregor studied hard and profited much. He came back to Nova Scotia in 1878, an apostle of scientific education and especially of laboratory training for students.

Shortly after his return, his friend J. J. MacKenzie, the promising young professor of physics at Dalhousie, died from inhaling poisonous gas during an experiment, and MacGregor was appointed in his place. He began amid a flood of difficulties. At first he had practically no laboratory equipment at all, and even in more prosperous times his apparatus was pitifully inadequate. But he was a tireless worker. Within a few years he had reorganized the physics department by making laboratory training a regular part of his course, thereby setting a precedent for Canadian universities.

With all his official duties, he still found time for research. The poverty of the college made it impossible to procure any but the cheapest and most general apparatus, but he was a born craftsman, and he made himself what he could not buy. President Mackenzie, who was one of his honour students, recalls that half their laboratory time was spent in resilvering cracked mirrors and rewinding crippled galvanometers. Of necessity, MacGregor was restricted to fields of research where simple apparatus would suffice. Many of his investigations, for example, were concerned with the theory of solutions and the ionization hypotheses. He was uniformly successful. He got results, and accurate results. During his twenty-two years at Dalhousie he published well over a hundred scientific papers. Of such merit were these that when in 1901 the chair of Natural Philosophy at Edinburgh was made vacant by the death of Tait, MacGregor was called to succeed his old teacher—perhaps as high an honour as could be granted a man of science.

MacGregor occupied the Edinburgh chair acceptably for twelve years. But his original work ceased with his departure from Dalhousie. He did not publish a single scientific paper after 1901. At Edinburgh he was rather the teacher and the organizer. His great achievement there was the introduction of the laboratory method into all the scientific courses.

Gordon MacGregor was of the type of the talented Nova Scotian Scot. His was the alert, keenly critical mind in which can exist no prejudices or misty notions. He was not a great constructive thinker; but as an experimenter and a tester of theories, he had few equals. His teaching was inspiring. The list of his honour students contains many names of international repute. Few Nova Scotians have brought more honour to their native province.

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Nova Scotian science has gone far since the days when the Halifax gentlemen read their first papers to the Institute of Science. The high-school boy to-day chatters of scientific facts which McCulloch never knew. Especially important, from the practical point of view, have been the remarkable technical developments along the boundary line between science and commerce. Nova Scotian colleges have contributed of their talent to Nova Scotian industry. The technical positions in the mining, fishing, and manufacturing trades of the province are filled almost exclusively by local talent trained in local institutions. Science has taken hold of every-day life; it has created new trades and professions, and it has greatly modified all the old ones.

In this industrial development a few men and events stand out. In the heyday of the clippers, Donald MacKay of Shelburne became one of the greatest builders of wooden ships, and Lawrence of Maitland constructed an enormous sailing vessel which caught the attention of the nautical world. In late years, Roue, a Halifax architect, has designed yachts and sailing vessels which have competed successfully with the fastest of their kind afloat. In 1909 a plane assembled in the Graham Bell laboratories at Baddeck, and managed by a local pilot, made the first flight in the British Empire. This is a distinction; but as the parts of the craft were constructed at an American factory, the scientific triumph cannot be credited to Nova Scotia. The following is a fact less well known, but one which should be given greater publicity. During the early stages of the Great War, when the British War Department appealed to manufacturers to devise a better steel for use in shells, the formula required was invented by the technicians at the New Glasgow Steel

Works. Quite recently, the Fisheries Research experts at Halifax have developed a method for the quick freezing of fish which seems likely to revolutionize the trade. Facts like these are typical, and they seem to many the most hopeful indication of the future industrial greatness of Nova Scotia.

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The brief and disconnected outline of Nova Scotia's scientific past which has been given seems to show one thing at least. Nova Scotians have been able, in the face of obstacles and distractions unknown to-day, to attain to seats of power and honour in the council of the learned. Now that these bars have been removed, is there any reason why the stock which produced a Dawson and a MacGregor should not give the world many more scholars of their intellectual breadth and their tenacity of purpose? The age of Titans, perhaps, is past; specialization and subdivision are the marks of modern science. But it is permitted us to hope that Nova Scotian talent and Nova Scotian industry will do much to speed knowledge to her necessary goal, which is nothing less than the scientific reconstruction of the world.