

Features



History of Canadian Geology

A Kind of White Obscure (Early Geological Studies in Newfoundland)

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Now, when the primary concerns of earth scientists are on subjects virtually unknown a generation ago, it is perhaps fitting to pause to examine a little of the base of the pyramid on whose peak we collectively stand in 1974.

As we look at metallogeny and plate tectonics, the sedimentary and volcanic rocks of deep ocean basins and their margins, and at the northeast end of the Appalachian Mountain system where it plunges into the sea, it might be useful to examine briefly what earth science was like 25 and 50, 75 and 100 years ago, and even farther back than that.

Nowadays, when geological papers are presented in swiftly efficient but extraordinarily dull language, the fashion of our time, perhaps it would be useful, too, to examine a little of the writings of an earlier time when elegance of language was a mark of scholarship.

Perhaps most fundamental for us is to recognize that the larger views of geology that we concern ourselves with are only possible because of the work of those who laboured at a time when only tiny fragments of the mosaic were in view.

In scanning recent publications I am constantly impressed how references and works cited rarely go back more than six to 10 years, yet the knowledge they are based on goes back through generations of geological observers. Perhaps age and wisdom, those greatly accumulating replacements for youth and brash advance, carry with them a growing sense of the essential continuity of human progress. I suppose this comes, too, from having worked in Newfoundland long enough to have experienced the last chapters of the pioneer period and still being around to see the present revolution. In Newfoundland, as elsewhere, there was no sudden beginning to observation of environment, for people have always looked at their surroundings and wondered. When did they begin seeing?

In 1763 an unknown, young Lieutenant James Cook of the Royal Navy was given command of a small ship, *Grenville*, and commissioned to do a survey of portions of the coasts of Newfoundland and Labrador, and on around The Gulf of St. Lawrence. He had been in the area in previous years as an assistant in other ships and had already proven himself an able surveyor and explorer. As this remarkable young man worked his way up the west coast of Newfoundland in 1763 and 1764, making detailed charts of shapes of shorelines and sketches of various landfalls, he noted the coal measures in the Codroy and St. Georges Bay areas, the white cliffs of gypsum gleaming here and there against the dark woods inland and on the shore, and the iron deposits at the head of Bay St. George. This was

before he changed our understanding of the geography of the vast Pacific Ocean and before he mapped the west coast of North America. When he was unfortunately killed on Hawaiian shores in 1779, Captain James Cook was a world figure.

One of the great figures of 18th Century science was Joseph Banks, a man of wealth and position whose great passion was to extend scientific knowledge. He was especially interested in biology and early in his life established himself as one of the great botanists of all time. At a period in Newfoundland history when French and English were disputing fisheries rights, Joseph Banks made arrangements to visit Newfoundland and Labrador in 1766 aboard *H.M.S. Niger*, under orders to establish a fort at Chateau Bay in Labrador and to undertake surveying at various places in the Great Northern Peninsula. His manuscript account of his findings was a landmark in the development of understanding of the flora and fauna of northeastern North America and included occasional references to geological features. Here, for example, is a brief description of the stratigraphy of the harbour mouth at St. John's.

"Went today to see the workmen who are Leveling for a fortification on the south head Collected upon the Beach a number of the starfish dryd by the sun on the top of the head where the miners are at work collected two Kinds of Stone the only sorts that I have yet found in Strata one is a Very Coarse Grit full of Pebbles of different Shapes which Lays the undermost the other is Grit also but of a much Clearer Kind which Lays over the Last forming the tops of all the Hills I have seen tho sometimes thin Beds of it are found between the interstices of the former" (Lysaght, 1971, p.124).

and at Croque, on the Northern Peninsula:

"but what better repaid my walk Even than the Sight of these Beautiful Prospects was the Finding appearances of a Large & well Furnishd stratum of Statuary Marble such at Least Who had no opportunity of Examining more than Exterior Surface which was Perfectly white & Clear treating it however Merely as Lime stone which upon Experiment it has Proved to be it is not to be neglected in this Island where that substance has not before been discoverd I therefore Give a very Particular Direction by which any Body who wishes to find it may do it with Certainty" (Ibid, p.143).

It is interesting to note that Banks met Cook in St. John's that year and began an association that lasted through many years including a three year voyage in Cook's *Endeavour* again pursuing knowledge of the natural world. How astonishing it is to look back upon a man of wealth giving up the "good" life to exist in cramped and crowded quarters on dangerous little ships for months and years to satisfy his passionate curiosity.

References are occasionally made to the importation to Newfoundland of Cornish miners between 1750 and 1775 to operate a copper showing at Shoal Bay but little is known of what they observed.

An account of the voyage of *H.M. Ship Rosamond* to Newfoundland and the southern coast of Labrador was published in London in 1818 and is sometimes pointed to as the earliest reference to Newfoundland geology. Perusal of this work, however, shows that it has hardly any geology in it.

Anspach's *History of Newfoundland* (1819) had a great deal more of substance about the geology of the country, as for example:

"To the mineralogist Newfoundland may probably present an interesting and abundant field, treasures hitherto unexplored, if credit is given to the only source of information which can be had on this subject, namely, the traditionary reports which are repeated with confidence by the oldest inhabitants of the island. From these it would appear, 1st that Conception-Bay has always been understood to contain mines of several sorts; that, at Chapel-Cove, at the head of that bay, there is a coal-mine. A lime-kiln was some years ago erected in that neighbourhood, and for

some time worked with tolerable success. 2nd. That there is an iron-mine at Back-Cove, on the northern side of Bell-Isle, near Portugal-Cove; another on a high hill, called the Look-Out, on the back of the town of Harbour-Grace. . . . It has also been positively asserted, by several respectable ancient inhabitants, that Shoal-Bay, lying between Petty-Harbour and Bay-Bulls, to the south of the town of Saint John's, contains a mine of copper ore; that, about the year 1775, some Cornish miners were brought over from England, for the express purpose of working this supposed mine; that an attempt was actually made, but soon after relinquished, on account of the expense, and the tardiness of returns adequate to the farther prosecution of the new undertaking.

"Doctor Forster affirms that there are in Newfoundland, as well as in Cape-Breton, such rich coal-mines, that, if they were worked, their produce would be sufficient to supply all Europe and America abundantly with this commodity; and that some even are so advantageously situated, that the coals might be thrown directly from the coal-works themselves into the ships as they lie close to the shore. This piece of intelligence, he says, he had from his late friend Captain Cook, who, for several years successively had explored the shores of this island, taken their bearings and respective distances, and laid them down on charts." (p. 367-369).

In 1822 John Baird described trap-tuffs, stratified amygdaloids, greenstone and claystone in the neighborhood of St John's. The first serious geological report on Newfoundland, however, was the result of a remarkable expedition undertaken in 1822, an account of which appeared in the *Edinburgh Philosophical Journal* of 1824. A one-page map in this paper showed for the first time in the history of Newfoundland something of the interior of the rectangular, main body of the Island, unknown until then except to the Beothic Indians and a few Micmacs who trapped there on seasonal forays. Its text was couched in the most polite terms. "I encountered more impediments in accomplishing the undertaking than were contemplated at setting out" hid a tale of exhaustion and starvation during an epic 2-month walk across a lonely, harsh, uncharted

country. One begins to understand the stature of W. E. Cormack when one reads how he was "not engaged professionally" in the spring and early summer 1822 so decided to walk across the Island just to see what was there.

At the beginning of September, 1822, he left Random Sound on the east side of the island accompanied by one Micmac Indian. This was a season of the year that he had deliberately picked because berries would be ripe, young game would have grown and birds left the nest, so that he could better live off the land. After many weeks of physical hardships in the woods and on the bogs and barrens of central Newfoundland, of walking around dozens of large lakes he found in his path, and eventually struggling for days through deep snow on the high western plateau, he arrived in early November at St. Georges on the west coast. After a brief rest there he walked on down to what is now Port aux Basques. From there, he worked his way eastwards in small boats along the south coast to Fortune Bay, where he found, alas, that it was so late in the season that nothing was offering to St. John's. He felt himself fortunate to avoid having to winter there by catching the last ship to England where he arrived some six weeks later.

Ophiolitologists in this country might reasonably date their antecedents to this remarkable Newfoundlander who never let his observing eye be dulled by the "impediments encountered" as he noted the natural things around him. Here is an example:

"A hilly ridge in the west, lying north and south, which had been in view several days, at about the centre of the Island, on our near approach bore an aspect different from any we had yet seen, appearing of a bright brown colour along the summit, bristly and castellated. The rocks for some miles to the eastward were often of various colours, and impregnated with iron, and the shores of the lakes presented remarkable coloured stones, resembling pieces of burnt clay and broken pottery. On our arriving on it, this ridge proved to be a serpentine deposit, including a variety of rocks, all lying in nearly vertical strata alternating. . . .

"The mineralogical appearances here were altogether so singular that I resolved to stop a day or two to examine them. All the highest parts of

the ridge were formed of this metalline rock, and were extremely sterile. The other rocks were: noble serpentine, varying in colour from black-green to a yellow, and from translucent to semi-transparent, in strata nearly a yard wide; steatite, or soapstone, verde antique, diallage, and various other magnesian rocks. Sterile red earthy patches, entirely destitute of vegetation, were here and there on and adjacent to the ridge, and on these lay heaps of loose fragments of asbestos, rock-wood, rock-cork, rock-leather, rock-horn, rock-bone, and stones light in the hand, resembling burnt clay, with many others; the whole having the appearance of heaps of rubbish from a pottery, but evidently detached from adjoining strata and veins" (1824).

Cormack's incredible walk of several hundred miles with only what he could carry on his back and glean from the land accompanied by one other man must rank as one of the epic traverses in Canadian exploration history. This remarkable young Newfoundlander of good family and education undertook this heroic enterprise with no other reward in view than to satisfy his curiosity about an unknown part of his country.

The post of "Geological Surveyor of Newfoundland" was offered to Joseph Beete Jukes in 1839. He had just finished his studies at Cambridge under Sedgwick and a few months of walking tours and lectures in central England. To give an idea of the times, a letter from Jukes to his aunt, dated March 14, 1839, includes the following:

"Sedgwick has just taken tea with me and I have been with him to the Royal Society tonight, where, among other things, I heard a notice from Sir J Herschel, read on the new process of drawing by sunlight or, as he calls it, photography." (1871, p.33)

And so, at the age of 28, Jukes sailed from Liverpool in the merchant brig *Diana* bound for St. John's, Newfoundland. A month later he was "peering over the side into the driving fog, but could see nothing but small jagged pieces of white ice, hardly to be distinguished from the foam on the crest of a wave, whirling about in the eddy of the vessel. Beyond them was a *kind of white obscure*, that might probably be the sheen of the ice through the fog." (1842, v. 1., p.2)

On May 8th they were standing back and forth across the mouth of the harbour with a light, but bitterly cold breeze blowing off the land. "The first view of the harbour of St. John's is very striking. Lofty precipitous cliffs, of hard dark red sandstone and conglomerate range along the coast, with deep water close at their feet. Their beds plunge from a height of from 400 to 700 ft., at an angle of 70°, right into the sea, where they are ceaselessly dashed against by the unbroken swirl of the Atlantic waves. This immense sea wall is the side of a narrow ridge of hills which strike along the coast here, and through which there are occasional narrow valleys or ravines. These transverse valleys cut down through the range to various depths, and the bottom of one being about 50 or 60 ft. below the level of the sea forms the entrance to the Harbour of St. John's . . . the dark naked rocks that frown upon the coast near St. John's, their stern outlines unbroken by any other vegetation than a few stunted firs that seem huddled together in the more sheltered nooks and hollows, give a stranger but an unfavourable idea of the country he has come to visit, and seemed to realize all the accounts he may have heard or read of the coldness and the barrenness of the land." (1842, v. 1, p.4).

On one of his first official expeditions Jukes went with his helper, Kelley, with knapsack, barometer, rifle, etc., walked to Torbay, took a boat along the cliffs for nine miles, then walked four miles to Flat Rock, and seven miles to Pouch Cove. "This path was just opened, the stumps were not cleared, and small poles merely laid down in the *softest* places, by help of which, and roots of trees, you kept from sinking; some small trees laid side by side helped us to cross the rivers." It took him another day and a half to walk on to Cape Francis and back to St. John's again (see 1871, p.52). Times and men have changed.

Here are a few excerpts from his reports:

"When I landed on Kelley's Island I found several workmen getting stone for the projected Catholic Cathedral in St. John's." (1843, p.52) A landmark in the making!

"In the upper beds of Bell Isle, those namely on the northwest side, there is but little stone, although one bed of bright-red sandstone about eight feet

thick was observed." (Ibid, p.82). This is possibly the iron ore of later decades.

They had anchored in a small cove called Grandy's Cove, perhaps part of the Burgeo complex.

"As we meant, if possible, to sail early the next morning, I landed just at sunset, to get some specimens of the rock, when a man came down, and, after looking at me with evident wonder for some time, at last asked me if I wanted ballast." (1842, p.196).

"One day one of the men came across to me from Great St. Lawrence with intelligence that a lead-vein had been discovered. On going over I found quite an excitement, and at least twenty people hammering and digging at the rock. The rock itself was a kind of sienite, consisting principally of red feldspar with interspersed crystals of quartz. A vein two or three inches wide was in one part filled with small crystals of fluuate of lime, and among these were some little cubical crystals of galena, and a coating of a greenish hue that might be green carbonate of copper. . . . It is just possible that more mineral veins and of better quality might be found in the neighbourhood . . ." (1842, p.204). The St. Lawrence fluorspar mining district with all its successes and tragedies of radioactive poisoning were thus foreshadowed.

On arrival in St. John's in the fall of 1840 . . .

"Thus ended my last excursion in Newfoundland, and I can only give my advice to any one who wishes to lead the life of a traveller to commence with this country, in order to get well accustomed to rough living, rough fare, and rough travelling, and to get rid of all delicate and fastidious notions of comfort, convenience, and accommodation he may have acquired by journeying in England. I must add, however, that so far as the inhabitants are concerned, under a rough exterior he will meet with sterling kindness and hospitality." (Ibid, v. ii, p.173).

The first public lectures of note in St. John's were not those given by Neale in the 70s or by Baird in the 50s, for in the winter of 1839-1840 . . .

"Dinner-parties are likewise abundant, in very good style and taste,

and of these I generally have to refuse one or two a week from pre-engagements. In order to contribute to the stock of amusement, Dr. Stabb and I are now giving some lectures on chemistry and geology . . . After all, however, we were 'both numerous and respectably attended' . . . I am writing a condensed report of my lectures to be published in a pamphlet form." (1871, p.92).

And the geology? During his two seasons in Newfoundland, he travelled the coasts of Newfoundland northward to Twillingate, southward around Cape Race, westward to Port aux Basques and northward along the west coast to Bay of Islands. He penetrated the western interior up the Humber and overland into Grand Lake to its head, and several of the rivers south of Bay St. George (Fig. 1).

We do not need at this time to detail all his findings but can note that in his travels he missed entirely the fossiliferous limestones and shales of the west coast but that the other main elements of the geology of the country were now known. Here is one passage however . . .

"At some distance from the granite the rock is thick-bedded mica slate, of a dark grey colour, the mica being in large flakes . . . Approaching the granite, and about one hundred yards from its boundary, small nodules and strings of yellowish quartz rock are visible in the mica slate. The mica slate then splits more easily into thin laminae, and is more varied in its composition, some beds having more the character of coarse gneiss, inter-stratified with others entirely composed of large flakes of mica. On continuing to approach the granite, the quartz veins and nodules increase, and nodular patches and bands of a regular fine-grained granite with but little mica appear. These granite portions are not veins proceeding from the neighbouring mass of granite, but integral parts of the beds; a perfectly laminated bed, gradually losing, first its fissile character, and then its laminated appearance, and passing in the direction of its strike into a band of fine-grained flesh-coloured granite several inches thick. This band of granite, after the course of a few feet, gradually thins out again, and the bed regains its original character of gneiss



Figure 1

Jukes on the shore of Grand Lake in 1839. An original sketch by R. W. Bradford.

or mica slate. This alternation and passing of one rock into another increases in frequency, until, after walking over the edges of many such beds, we find ourselves imperceptibly led to a mass of red or flesh-coloured granite perfectly crystalline, and having no appearance of any lamination or bedding whatever. In the granite itself, however, for some distance from the junction, nodular masses of the black rock mentioned before as consisting of minute scales of mica were observed . . . Altogether the gradual passage or transition from the granite into gneiss and mica slate was most remarkable. The granitic portions contained in the mica slate and gneiss struck me as just such as would be produced supposing great heat to be applied to a mass of rocks, some portions of which were in a state to be more readily affected and more thoroughly changed by it than other and intermediate parts." (1843, p.98-99).

"In November (1840) I sailed from St. John's in Her Majesty's steam-ship *Spitfire*, which I mentioned as she was the first steamer ever seen in a Newfoundland Port." (1842, v. ii, p.173).

And so ended Jukes' adventures in Newfoundland. His published map is the first deliberate geological map of Newfoundland and one is constantly

surprised in reading his accounts, as in the granitization essay, how much aware of processes he was.

In 1864 Alexander Murray came upon the Newfoundland scene to re-establish the Geological Survey of Newfoundland. This chapter really started in 1842 when the Geological Survey of Canada was instituted by the Government, on a petition of the Natural History Society of Montreal. Mr. W. E. Logan was appointed Provincial Geologist but, owing to unfulfilled business engagements in England, he asked for leave of absence and spent the winter of 1842-1843 in the old country. Here he appears to have first met with Alexander Murray in the beginning of 1843 and to have engaged him as his assistant. It appears that Murray did not have much formal training as a geologist but a naval background made him ready for surveying and he had had a bit of practical experience under Sir Henry T. De la Beche during 1841. He came to Canada in May of 1843 and immediately began operations in the western province while Logan returned from England via Halifax the same spring and went to Joggins and the Gaspé. "This was the commencement of the Geological Survey, which has since been extended to nearly all parts of the northern half of the continent." (Bell, 1892, p.87).



Figure 2
 "Falls on the River Exploits, Newfoundland",
 from a textbook of geology written by Jukes in
 1853.

When Logan and Murray commenced the geological survey of old Canada, the greater part of both provinces were uninhabited, unsurveyed and unknown. It must have required some uncommon courage for two men to undertake this immense task yet for twenty years these two men were the backbone of the Geological Survey.

Then, "In 1862 or 63 the Hon. James Rogerson, a member of the Newfoundland Government, when on a visit to New York, had a conversation with the Hon. Archibald, the British Consul General there as to the mineral resources of the colony, when the latter recommended the institution of a geological survey and gave Mr. Rogerson a letter of introduction to Sir William Logan. He afterwards met Sir William who entered warmly into the proposal and offered to send Mr. Murray to undertake the work. . . . Murray left Montreal on the 18th May 1864 with Mr. H. H. Beckett as assistant in order to enter upon his new duties." (Bell, 1892, p.90), and for 20 years again was the backbone of a Geological Survey.

"Murray was remarkable for having, as it were, duplicated his life history, or to have enjoyed two separate spans of life of about the same duration, in each of which his career was very similar in nearly all respects. He repeated in Newfoundland the same kind of preliminary geological and

topographical work he had done in Canada, and having married and brought up a family in the latter province, he became a widower, and, on going to Newfoundland, married again and reared a second family of children. So completely separate were his two spheres that one is oft to think of him as he would as two distinct individuals, and his biography must necessarily branch into two separate parts." (Bell, 1892, p.80).

Murray was a superb surveyor and the original work that he performed in Newfoundland during the 20 years he devoted to it were of great service in making the island favourably known to the outside world. At first his reports pointing out the potential of the island were received with scepticism, but after a time there was a reaction in the opposite direction and a positive mania for mining and prospecting set in. His surveys led to the carrying on of new lumbering operations in several parts of the Island and agricultural possibilities were given more serious attention in the valley of the Humber, the Exploits and the Gander, as well as around Bay St. George. Murray wrote little for publication besides his official reports. In Newfoundland these included his regular Annual Reports ending with that for 1881 and his contribution to the landmark geological map compiled in the 1880s and published in 1905 by his assistant, James Howley.

Where Cormack's was the first geological traverse of importance, and Jukes' the first regional geological investigation, the Murray period was the first one of regular continuous scientific investigation. But as Bell, his biographer, put it in 1892 . . .

"His services to the topography and geology of Canada and Newfoundland were very important, and deserve to be gratefully remembered. Although he was a well known figure in old Canada during the period of his active employment, so rapid are the changes in a country like ours, and so quickly do the newcomers occupy the places of the pioneers, that the labours of Murray are already being forgotten; and, at most, only a vague impression remains of what he actually accomplished even among those who have most to do with similar work in these provinces at the present time." (Bell, 1892, p.7).

Having seen Murray through to his retirement in 1883, let us revert a little for there were overlapping events in the history of geological investigation in Newfoundland. Logan's *Geology of Canada* has extensive measured sections and many details of the stratigraphy of the west coast in it. Perhaps it is another measure of Logan's greatness that he realized clearly that the secrets of North American geology could only be unravelled by examining the evidence from wherever it was available, including Newfoundland, especially along the Straits of Belle Isle by early GSC men including Logan himself, Billings and Richardson. Indeed Logan's great work, published in 1865, was not much improved upon for generations.

John Milne, writing on *Notes of the Physical Features and Mineralogy of Newfoundland* in 1874 in the London Quarterly Journal, mentions that Agassiz, in the 1864 Atlantic Monthly, accounts for the appearances of striations, scratches and boulders by an enormous glacier, 6,000 ft. in thickness.

"It has also been observed that at one period Newfoundland was probably covered with a dome of ice which, radiating as it floats, ground and scooped out the surface over which it moved, thus giving to the Island its present configuration. If this ever were the case, then it would seem from the highlands in the west

and south west, the general northeast tendency of the rivers and river valleys, and also that of the long narrow lake basins with which this Island is covered, that the greatest flow of ice was probably toward the east, a direction apparently diametrically opposed to the Arctic current, but yet agreeing with that of the striations and the positions of the boulders, which, according to Mr. Jukes, appear to be all derived from adjacent rocks."

In this account of glaciation, which is clearly modern in its concept, there is a certain nostalgic attachment to the idea of drifting ice, particularly in view of the fact that the terraces and other uplifted features showed the authors of the day that Newfoundland was rising out of the sea. Milne points out that at Little Lawn reddish feldspar, galena and blend associated with green feldspar occurs and has been worked. He states that "flourspar being, comparatively speaking, a rare mineral on his side of the Atlantic, its occurrence here, perhaps, ought to be especially noted." Milne writes at length about the gypsum deposits and says that Murray suggests that some of the structures within them have been produced by an increase in bulk arising from some chemical change going on as in the conversion of the carbonate into a sulfate.

Following the retirement of Alexander Murray in 1883, his Newfoundland assistant, James Howley, carried on until 1910 but it was never on the same level of scientific investigation. However, the geological map of 1905, the compilation of everything known to date and mostly based on the work of Alexander Murray and Howley, pretty well delineated the major elements of the geology of Newfoundland. This map and their Annual Reports, extending from 1864 to 1910, were the main source of information on Newfoundland natural history for several decades.

One of the interesting parts of perusing the history of Newfoundland geology in the early part of the twentieth century is the variety of the great names of American geology that keep cropping up. It seems that Logan was not the only one to realize that there was a unique record of events on this island. Thus we find Charles Walcott visiting several times to study the Cambrian fauna in Conception Bay. In the summer of 1900, R. A. Daly was a member of a schooner

expedition to Northern Labrador and while they were detained by drift ice and head winds in Quirpon Harbour at the extreme northern end of Newfoundland went ashore looking at the rocks. It is interesting to note that at this time Daly was more concerned with the explanation of the variolites and the pillow structure than anything else.

T. C. Chamberlain was there. Charles C. Mook wrote on thrust faulting in western Newfoundland in the Geological Magazine of 1926 in which, incidental to work on the coal fields, he noted "faulting of the Appalachian type". In the early part of this century an expedition went around the north coast in a schooner and GSA Memoir No. 1 on the *Stratigraphy of Western Newfoundland* by Schuchert and Dunbar (1934) must be listed as a prominent landmark. Throughout the late twenties and thirties expeditions from Princeton University supplied more and more titles of local data to the growing mosaic of Newfoundland geology. Some of these were doctoral theses and some were by staff members and we have Hess, Sampson, Buddington, and Howell appearing on the scene. In 1940 a remarkable issue of the Bulletin of the GSA appeared with Twenhofel, McClintock and Flint making major contributions to the knowledge of surface features of this country.

The Geological Survey as such was begun for the third time in the late 20s under Baker but sputtered out in three or four years. The Survey again started under Snelgrove on a part-time basis in the thirties and produced the white bulletins of major importance in any history of the Geology of Newfoundland.

There is thus no sharp beginning to modern geological investigation in Newfoundland but by 1949 and confederation with Canada the picture of Newfoundland regional geology had begun to take a modern shape. The old 1873 manuscript map of Murray, revised in 1895 and published under Howley's name in 1905 and again in 1923, gave way to a sketch map compiled by Rose in 1947 and then the first modern map compiled by the author in 1955 in the fifth revival of the Geological Survey of Newfoundland. From then on we might reasonably decide that we have emerged from the "white obscure". Yet, how strange it is that the more we seem to find out in any area of investigation, be it pure science or human behaviour, the

horizon is still there, always inviting us to go closer. We have more problems now than Jukes did. Where will the horizons be teasing us to approach in 25 or 50 or 100 years? . . . Will we be then as far away from where we stand now as our present position is from the world of Jukes and Murray?

How strange it is too to recall from our history that explorers for centuries have set out across the unknown seas to discover what was in distant places when they did not even know what was a half mile directly below their feet or what was beneath the sea just there in the harbour mouth or a mile off the coast. Right now we are experiencing great excitement as we discover the insides of the oceans, explore their temperatures and salinities, their currents and their depths, map for the first time enormous mountain ranges, tens of thousands of miles long and higher than anything on the land surfaces and great valleys and plains spread out beneath the sea, all invisible until we bothered to look. On this Island we are astonishing ourselves with what we are finding out about the fundamental building blocks of the earth's crust, of rocks generated in the oceanic depths along, in, and beside plates and ruptures and ridges. Imagine missing this for so long! And what are we missing now that will be causing excitement in a few years?

For those among you impatient for reports of progress instead of historical and philosophical introspection, let me speak a little in the words of that most wonderful of geological writers, Archibald Geikie.

"In science, as in all other departments of inquiry, no thorough grasp of a subject can be gained, unless the history of its development is clearly appreciated. Nevertheless, student of Nature, while eagerly pressing forward in the search after her secrets, are apt to keep the eye too constantly fixed on the way that has to be travelled, and to lose sight and remembrance of the paths already trodden. It is eminently useful, however, if they will now and then pause in the race, in order to look backward over the ground that has been traversed, to mark the errors as well as the successes of the journey, to note the hindrances and the helps which they and their predecessors have encountered, and to realize what have been the influences that have

more especially tended to retard or quicken the progress of research." (1905, p.1-2).

In the same way that I am moved by the human experiences of Cormack and of Jukes, of Alexander Murray and of Schuchert, of James Richardson and of Logan, I conclude from my experience of life that being human in 50 or 100 years will have the same fundamental satisfactions as being human now. Perhaps the most satisfying activities for people of our kind will still be those we have been examining in the histories of pioneer Newfoundland geologists - probing our environment and wondering about our earth, solving one problem of history or mechanism only to find others uncovered in the infinite process of discovery.

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