Harbour, occur at Jegoggin Point. From these we may have the supply of magnetite.

The magnetite represented by the sections described has also been rendered obvious by reducing pieces of the rocks to a powder in a wedgewood mortar and extracting the magnetite with a magnet.

ART. VIII.—SOME PHYSICAL FEATURES OF NOVA SCOTIA, WITH NOTES ON GLACIAL ACTION. By M. MURPHY, C.E., *Provincial Government Engineer.*

(Read April 14, 1884.)

FROM the year 1869 to 1872 it was my duty to survey some of the Gold Districts which lie in various directions along the Atlantic slope of the Province; and subsequently it became a no less pleasing one to conduct some railway surveys, the course of which was right across the general direction of the strike of the gold-bearing rocks. During these labours and journeyings my work was entirely confined to surveys and public works. Such observations as I was able to make of a general scientific character, were necessarily incidental, hasty and external; however, these defects of hurried and superficial observation will be found in the details only. I am able to place before you a correct representation of the geological skeleton, the characteristic outlines, and true topographical section on two lines of profile across the province, between the Bay of Fundy and the Atlantic shore. The line of railway in operation from Halifax to Windsor gives a third such profile. All are between the 44th and 46th meridians, and are nearly parallel to one another. These sections or profiles may be said to possess advantages in facilitating the formation of more comprehensive views on the large scale, and may also tend to enable other and more definite contributors or observers, by adding one range of vision to another, to take in at a glance a much more concise perception of the extent and general outline of their more prominent features.

The sea board of the south-east coast, between Cape Canso to the north-east and Cape Sable to the south-west, is no less than 230 miles in a straight line, the general trend being about east-by-north and west-by-south. Throughout the whole extent of this rocky coast, say "The Sailing Directions," are numerous "indentations, varying in size and utility, from the narrow creek "in which boats seek shelter, to noble harbours, of which Halifax "is the largest, most accessible and safest."

A well defined low mountain ridge courses with nearly the same trend as the shore line, and forms the principal water-shed of the Peninsula; its slopes run northerly and southerly from it, the latter, or southern slope, being somewhat undulatory, but regular in its descent to the Atlantic.

The south-eastern slope, for nearly its entire length of over two hundred miles, has undergone very extensive denudation; the phenomenon of scratching and polishing prevails almost everywhere over its surface; the striæ are remarkably distinct in many places. Point Pleasant and Leahyville, near Halifax, are examples. When the drift or boulder clay is removed, the scratches and furrows are frequently met with, and they are generally in the same direction; yet, there are some places where the striæ, or markings, exhibit different courses. Near Morgan's, on the LaHave river, the course is S. 63 W., whilst in a valley about five miles east, the course is quite different, being nearly north and south.

The direction of the strike of the gold-bearing rocks is generally very regular, and nearly at right angles to that of the glacial groovings, the former being nearly east and west, whilst the latter is north and south. Subjoined I give the general direction of the strike of the slates in our principal gold mining districts, with as many notes of the courses of the striations as I am able to place before you:

	Course of Strike.		Course of Striæ.	Year when taken.
1. Goldenville, nearly	E. and W.		N. and S.	
2. 15-mile Stream	S. 80, E.		S. 10, W.	1868
3. Beaver Dam	S. 57, 30, E		S. 5, W.	1871
4. Tangier	E. and W.		S. 20, W.	
5. Carriboo Moose River	N. 87, E.			1876
6. do. Lindsay Lake	N. 75, E.			1881
7. do. Musquodoboit	N. 74, E.			1864
8. Gay's River (conglomerate)	N. 78, 25, E.		N. and S.	
9. Lake Catcha	N. 72, E.			1882
10. Chezzetcook	N. 75, E.			
11. Lawrencetown	S. 87, E.			1862
12. Waverly	N. 81, E.	(Exposure near W. Junction)	S. 5, E.	1865
13. Oldham	N. 82, E.		N. 10, E.	1862

The direction of the strike and the year when taken, were obtained through Mr. Carman of the Public Works and Mines Office. Some of the courses of the striæ were taken by myself, others by parties to whom I have applied in the present year. The bearing is magnetic.

The unmistakable traces which are so marked shew that vast glaciers must have once existed here, or, that these markings are due, as Dr. Dawson in his Acadian Geology seems to favour, to the abrasion of the rocks by icebergs coming from the direction of the sea. We have the carefully prepared and almost conclusive reasons given by Dr. Dawson on the glaciers and icebergs of the Post Pliocene period, published in 1868; but we have other authority on glacier action by equally active observers, such as Professor Tyndall and others. In examining the evidences which are illustrated by markings or striation running in the same general direction in Nova Scotia, and other phenomena which they suggest, it is not easy to assume any definite conclusion respecting this theory or that. Whilst quoting such authority let us approach this subject gradually.

Professor Tyndall, after discussing snow-crystals and regelation in his work "Heat as a mode of motion," discourses from actual observations of his own among the Alps, as well as from the records of other writers on the glacial action now going on in the Himalayas, the Andes and many other snow-laden mountains; and propounds the theory that the scars, flutings and furrowings visible along the valley of the Rhone for a distance of 80 miles. until lost in Lake Geneva, are due to the same cause. For, says the learned Doctor, " Grand as the present glaciers seem to those who explore them to their full extent, they are mere pigmies in comparison with their predecessors." By their predecessors he means, as expressed previously, traces of ancient glaciers.

There are many theories for the cause of glacier motion.

1. That of Dr. Saussure,—The slow but continual sliding of the icy masses on inclined bases.

2. The dilation theory, from expansion of water accumulating daily in its fissures, tending to urge the glacier onwards.

3. Then there is that of Professor Forbes, viz:—A glacier is an imperfect fluid or viscous body which is urged down slopes of a certain inclination by the mutual pressure of its parts.

The Encyclopedia Britannica, after giving in its usual precisive style, a description of the glacier, concludes its last paragraph on the subject thus:—" The problems of the cause of glacier motion cannot yet be considered to be satisfactorily solved," and goes on to quote the contributors on the subject, such as Professor James Thompson, Professor Forbes, Sir William Thomson, Tyndall, Faraday and others, ending with the views of Dr. Croll, who regards the motion of ice of a glacier as molecular, resulting from the very conduction of heat through the mass of the glacier, which will melt the ice and create a wave of thaw, but will in turn freeze again and cause a downward movement in the direction which has the least resistance, and the direction in which gravitation co-operates.

If we take a broad view of the extent of surface which exhibits such markings as those under consideration, we can scarcely admit the theory of a gradual subsidence and the re-elevation with the action of the sea and its currents bearing ice at certain seasons of the year, which is really that of Dr. Dawson.

The slope running back from the south-eastern shore to the top of the ridge of the low mountain range all the way from Cape Canso to Cape Sable, although rugged, undulatory and serrated, in numerous places, is nevertheless free from very high protuberances.

A large extent of its surface is so much denuded of drift that any extensive forest fire burns up all the clothing on patches of its surface, leaving the rocks so bare that the miner is invariably tempted to prosecute a search.

The presence of granite patches here and there at the existing surface, shewing that the denudation had reached so far, and the evidences of a granite nucleus in the higher ridge outcropping in like manner, shews that most of the strata under which the granite was consolidated have been reduced to a mere shell by denudation, a work which we could scarcely attribute to depletion by icebergs alone.

And again, the markings are mostly flutings or furrowings, and the mechanical action which caused them can be more reasonably attributed to a slow grinding process than to the force of impact by icebergs, which would exhibit more denticulated or notched abrasion.

The nature and extent of the work performed in excavating and removing a depth of rock surface probably greater in height than some of our present mountains, and extending over two hundred miles in length, could, to our senses, be more reasonably assigned to the agencies exerted in the glacial period or ice age, than any other we can conceive. If we assume a uniformity of action, and adopt the assumption that the whole slope of our Atlantic sea board was being sculptured or shorn at one and the same time by glaciers moving from the north, we can comprehend, to some extent, the cause of the glacial markings. The theory of Dr. Honeyman, of the drift from the north, is the only one that will truly reconcile us to the great effect produced. If denudation other than that of glaciers contributed to reduce the rock surfaces now visible above the sea level, they must have exerted their influence before the Post Pliocene period. The flutings, as I would call them, are, no doubt, the work of large superimposed masses moving slowly; and these traces are on the floor, on the surface of our rocks only,—they have not been observed lower, so far as I can ascertain.

If we carefully observe the fluted-like etchings visible on the rock surfaces of Nova Scotia, with the view of determining for ourselves whether these markings were caused by a slow grinding process, or by the abrasion of icebergs striking, rocking or slipping on an inclined rock surface, we will, I have no doubt, conclude that the former, viz, the slow grinding process, was the much more likely to produce them.

If we judge from effect, there is no reason whatever that Dr. Honeyman's theory, which is, also, I believe, that of Sir William Logan and Professor Hind, that larger masses of ice moving in glacial form over the surface, and carrying with it pebbles and boulders, is not the correct one to assign to the work performed. There are so many evidences which tend to establish it, both from a mechanical and theoretical point of view, that it would be superfluous here to mention them. They are plainly given in Dana's text-book of American geology, as well as by Professor Tyndall and other writers, who have made the subject a study.

We cannot, however, stop here: there are other features to be accounted for; they are, viz:—The old sea beaches and a local drift, which must have occurred at a more recent period. For, if these beaches then existed, and also the local drift, which I shall hereafter more particularly refer to, any glacial movement must have carried them with it, and deposited them elsewhere in a much more irregular manner than their present appearances would indicate.

I have been considering this matter, and give some notes on the subject for what they are worth.

Every practical miner in our gold fields knows (for every miner in Nova Scotia is also a prospector or searcher for paying-quartz leads on its surface), that if he finds a boulder shewing gold, he will invariably look for the lead or quartz vein to the north of where he finds it, so sure is he of finding the lead to correspond in width and richness as is indicated by the boulder, and that he will exhaust, probably, all his means in the search, or succeed in the find. The direction in which to prosecute the search and the distance, which will vary generally, according to the depth of the drift, is so well understood as to become proverbial.

The quartz boulders are not at all weather-worn, their edges being just as sharp as when broken from the vein or lead (as it is called) to which they belonged.

Let us reject the assumption that the gravel ridges remaining on the top and slopes of the South Mountain are old sea beaches, and for the present call them Moraines, and inquire only into the first postulate, by asking the question: Assuming that there was a glacial movement over the surface of our south-eastern slope, cutting the rocks by a shearing force and carrying them with it, how can we account for the more local movement of the quartz boulders?

These boulders appear on the surface; they may have been broken from their beds by agents such as are now active, viz: the alternating influence of frost and heat.

I know that the frosts of winter will keep boulders on the surface, although they may be again and again covered by silt. I can account for the lifting by the process of freezing. If we could, in this same way, account for the travelling in a southerly direction, which is not so improbable, we might solve the problem of the local drift.

The fact of the distance from the lead being dependent upon the depth of the drift, favors an assumption that in the process of lifting there was also a travelling movement.

It has been remarked to me by very practical observers and searchers, such as Mr. John Anderson, of Musquodoboit Harbour, and Mr. Fraser, M. P. P. for Guysborough County, that miners observe, when costeaning from the boulder northerly, to look for the lead, they frequently find traces of quartz of the same kind, from the boulder on the surface to the lead *in situ*, graduating from one to the other. This fact would go to shew that the upward movement was gradual, and it would not be a great stretch of imagination to assume that, as the boulder was lifted by the process of freezing, it would be forced somewhat in the line of least resistance—i. e., if it was frozen a little firmer on the north side, it might cause a movement southerly. If these facts were more carefully looked into, the local drift might be accounted for.

My greatest trouble is the old sea beaches. I cannot assign their existence to originate from Moraines, because they appear to be of similar constitution to our sea beaches of to-day.

In a paper read by Mr. Gilpin, Government Inspector of Mines for this Province, before the North of England Institute of Mining and Mechanical Engineers, he says:—"There seems to have been two periods of attrition and transportation. The effects of the earlier are now visible in immense "boar's backs" from 50 to 150 feet in height and sometimes a mile in length, following a general north and south course;" and again he says: "A second and more local action is also visible, and by its agency the auriferious veins are usually found. This action has carried the quartzite and slate boulder from 100 to 1800 feet, on a course corresponding very nearly to that of the striæ. Thus prospectors finding auriferous quartz boulders, costean to the North, and frequently trace the boulders to lodes corresponding in every respect to the boulders first found."

If our surface, as is shewn by research, has undergone great and remarkable vicissitudes during geological history, with alternating epochs of genial temperature and snow and ice, the striation and polishing of our rock surfaces may have been effected by glacial action; and subsequently another, and less destructive movement of the same nature, may have taken place which might account for the local drift according to the theory of Mr. Gilpin.

1. Geological.

Commencing at the shore of the Bay of Fundy, we first encounter a thick bed of Amygdaloidal trap, varying in colour from gray to a dull red. It is full of cavities and fissures filled or coated with quartz and other associated minerals. It forms the face of a cliff and rises vertically to a height of 110 feet, and from thence rises gradually with its associated slates and schists, until it attains a height of 595 feet in a distance of three miles; from thence it descends to the Annapolis valley, 345 feet below the summit, within the distance of a mile.

We have now crossed the North Mountain, a narrow ridge not more than four miles wide at its base, and attaining a height of nearly 600 feet, and have reached the Annapolis Valley, which from here to the Village of Nictaux, a distance of 7 miles, is of regular surface, and covered with drift. This latter distance is said to be Trias, or New Red Sandstone, but we could not, within the limit of our observations notice any outcrop which shews sandstone rock *in situ.*

The iron ore bearing strata of the south side of the Annapolis Valley, which are first met at Nictaux, have been described by Dawson as Devonian, but Dr. Honeyman, from recent explorations, is inclined to place them much lower. I am able to place before you some fossils taken from the iron deposits themselves at this place, which may assist in determining the age of the strata here. The slate here has a strike of 45° E. and dips N. 85° and continues up the valley of the Nictaux River to the 15th mile. At the 13th, and again at the 13½ miles the outcrops of some of the Cleveland Magnetic Lodes present themselves. Two at the 13th mile, 5 to 8 feet thick, each are said to be very rich. They run N. E. and S. W. across the line of the mountain-range with a slight northerly dip, and were only two of many which the Cleveland Iron Company have opened up by prospecting. At 14½ miles Smith's Bluff is reached, where the formation changes from slate to granite. Here we encounter a solid bluff of the latter, but for a short distance only. We are now in the granite region. From here to the crossing of the LaHave River, a distance of 28 miles, any visible outcrop met with shews "porphyritic granite."

Immediately upon crossing the LaHave river, at the 43rd mile, there is a transition from granite to slate, which is seen in the beds of the various streams, and in the gravel round Wentzell's lake. The strata has a strike of south, 60° W., and dips northerly at an angle of 80°, the cleavage being nearly vertical.

We are now in the Lower Cambrian formation, or the auriferous region. At 47 miles, at Morgan's falls, the strike is north 63° E., the dip is northerly 87°. At Riversdale, 49 miles, the strike is N., 60° E., dip 87°, N. At 60 miles the strike is N., 65° E., the dip is vertical. At 61 miles we lose the slate in our line of survey, drift, with granite boulders, taking its place, which continues to Bridgewater.

Local Topography.—Bay of Fundy to Atlantic, through Nictaux.

I give the local topography along the line of survey in the words of my report made in the year 1875:

Commencing at the Middleton station, on the Windsor and Annapolis railway, it crosses new pasture land, tillage, orchard, meadow, orchard again, and choice intervale to Annapolis river; thence to Nictaux village, clearings, light alluvial pastures, three orchards, and some spurs of spruce woods. For this distance of four miles throughout, the soil. is alluvial and mellow, famous for its great natural fertility, as is all the Annapolis Valley, by producing in abundance most of the grain and fruits belonging to its latitude.

From here the line begins to ascend the western slope of the hill-side of the Nictaux river. Keeping an inclining contour, no serious depression or ravine obstructs the course, which is over an apparently good surface, with occasional outcrops of slate. A mixed growth of heavy timber,—beech, birch, elm, pine, spruce and hemlock—clothes the hillside.

From 6 to 7½ miles, still keeping the same inclination, and following in like manner the contour of hill-side, the same heavy and mixed growth of timber and surface is passed. Here Smith's Bluff is reached, thence to 8.18 miles, where it crosses the Nictaux river, the surface is rough; burnt woods, with some patches of timber still standing, intervene.

From 8½ to 9½ miles, still keeping on the east bank of the river, and still inclining upwards with the same grade, very heavy timber, consisting of hemlock, spruce and hardwood, is passed, as well as some choice farming lands. At the 10th mile we reach the mill-dam of Messrs. Pope, Vose & Co., and from here to 11 miles the surface is denuded of soil by forest fires, and any timber met with is stunted and scrubby.

From 10½ to 12¾ miles, the surface is rough and barren, covered by granite boulders, recent forest fires having destroyed all vegetation; thence to the 14th mile we cross over beautiful intervale soil clothed with heavy hardwood, spruce, and hemlock.

Somewhat similar surface and mixed growth of fine timber continues to the head of Waterloo Lake, which we skirt on the east side. From the head of Waterloo Lake, crossing the Halifax road, we soon reach the clearing or pasture land of Mr. John Stoddart, where we attain the summit of the watershed or highest elevation, tract of intervale land growing fine black ash timber.

For the next mile the trial line traverses a meadow, mostly spongy and arid, but with intervening patches of good pasture. At 24 miles, we reach Freeman's Lake, and skirting along its west side, we pass some of the beautiful pasture lands of Springfield, which encircle this lake. From here for 1½ miles, we pass through rocky, barren soil, with a growth of scrubby timber, to Falkland Ridge Road which we cross at 250 feet to the right of the bridge across Beaver Brook. From here to the foot of Mill Lake the surface is principally pasture, with occasional clumps of heavy hemlock. The line here is about midway between the farming districts of Falkland Ridge and Lake Pleasant; the former two miles to the left, the latter the same distance to the right. The soil along the lake is free from rock and well adapted for agricultural purposes, as is manifest by the numerous thriving farms in the neighborhood; thence to the outlet of Mill Lake a belt of soft wood is traversed. At 29 miles we cross the Lunenburg Road and follow the contour of the east side of an open hardwood ridge, sloping steeply towards Mason's Meadow. Soil on this hillside is a light rich loam; the hardwood is, however, soon supplanted by a growth of hemlock and spruce; and the surfaces changes to rough, rocky ledges, until the level of the meadow is reached at 33½ miles. From here to 35 miles sandstone boulders are met for the first time, drifted together with granite and the eastern side of a barren, thence to the crossing of the LaHave River, at 36 miles, we pass through some good timber lands of mixed varieties, and reach a meadow which extends to the bank of the river.

From here we follow the river and public highway along the east banks of Germany Lake, diverging somewhat at Chesley's. From thence to Bridgewater, a distance of 16 miles, the line follows respectively the road and the river; both are in close proximity, the surface regular throughout.

The general character of the surface for the last 16 miles is that of a long, rich agricultural valley, bounded on each side by a continuous line of hills of various forms and surfaces. The timber is heavy, pine is frequently met with; but the growth principally varies with the varied surface of the land.

The country, so far, sketched along the line of survey, ought to be understood as being local. There are many thriving settlements and farms, not mentioned here, lying in close proximity.

DRAINAGE.

The southern promontory of Nova Scotia lying west of the 64° of longitude, embracing the counties of King's, Annapolis, Digby and Yarmouth, on the north and west, and those of Shelburne, Queen's and Lunenburg, on the south and east, are very marked both as to typography and drainage, extending in a south-westerly direction beyond the 66°, between the Bay of Fundy and the Atlantic Ocean. The South Mountain range of elevated land extending from the Basin of Minas to near Annapolis Royal, in the same south-westerly direction, and from thence converging more southerly through the County of Digby, forms the grand features of the country and regulates its drainage, disposing of its surface water from the northern slopes through the rivers Annapolis, and Cornwallis, which run respectively south-west and north-east to the Basins of Annapolis and Minas.

The Windsor and Annapolis railway found an easy location along these rivers, which traverse the two beautiful alluvial valleys of Cornwallis and Annapolis, famous for their natural fertility.

The physical features of the country south of the South Mountain, are very different to those described on the north side. Instead of the rivers receiving the drainage and running laterally with them, they run at right angles to them, and course nearly parallel to each other. Such are the Gold River, LaHave, Port Medway, Liverpool and Jordan rivers.

The summit of the water-shed is crossed between the Nictaux and LaHave rivers; these rivers here interlace and cross each other in a series of lakes lying in an extensive plateau.

TOPOGRAPHY ALONG ANNAPOLIS AND LIVERPOOL LINE OF SURVEY.

We started from the Annapolis and Yarmouth "Interior survey" at a point distant from Annapolis 11¾ miles near Quarry Road, on the east side of East Branch, Moose River. The line follows the course of the stream to the Hessian line road, which it crosses at one hundred and twenty-nine feet east from the bridge. Thence keeping the east side of the stream, and gradually ascending the side hill, with a grade of one in ninety, or 58·7 feet per mile, till it reaches Lake Katy, where it crosses the river at the outlet from lake. Continuing along the east side of Lake Katy to near Virginia Settlement, it crosses the road bearing that name and thence follows the general course of that road till it arrives at Mud Lake, crossing the head of same and thence running direct to the lake known as "Head Waters of Liverpool River." Having arrived at the "Liverpool Head," we were then on the southerly slope of South Mountain, and on the water shed of Liverpool River.

The distance of this summit from Liverpool, in an air line, is nearly fifty-five miles, and the elevation five hundred and sixty feet above the sea. Keeping the west side of lake, crossing Sandy-bottom Brook and Virginia Road, running along the south of the latter for one-fourth mile, recrossing the same, and keeping its north side to Liverpool and Annapolis post-road at Milford, following the road through Milford Settlement; thence along the western side of Long Lake, keeping the general course of post-road, and following the western side of Branch Lake, and the same side of Maitland River to Five Mile Lake, and from here along the western side of Liverpool River we arrive at Millford.

The slopes of the adjoining hills are well covered with heavy timber, pine, spruce, hemlock, and hardwood.

Leaving Caledonia, the line crosses the course of the lake, near the post road, Mr. Moor's farm road and the "narrows" of McLeod's Lake, keeping the valley along same, crossing Smith's mill brook and entering a meadow, distant from Brookfield one half mile.

Leaving Brookfield and taking a south-easterly course, the line crosses Payzant's and Cameron's farm roads, runs close to Christopher's Lake, and crosses Cameron's river, at up-stream side of bridge on main post-road, between it and Bear Trap Lake to a stream bearing the same name, following the westward side of lake to the 45th mile, thence to the western side of Moose Horn Lake, crossing Seventeen Mile Brook at about one half mile from main road, striking Greenfield and Sixteen Mile Settlement road, about two miles from Greenfield.

Thence the course taken continues across Fifteen Mile Brook and through Allen Morton's pasture, about one-fourth mile from Middlefield, meeting the new Greenfield road at a distance of 150 feet from the main road, and taking the east side of the latter to Ten Mile Brook, which it crosses at one hundred and twenty feet from the bridge on post road; again crossing this road, it strikes the eastern side of Ten Mile Lake.

Most of the ground over which the survey passes in this distance of fifteen miles is almost denuded of alluvial surface.

Continuing along the east of Ten Mile Lake, and the west side Liverpool and Annapolis road, the line crosses the Liverpool River road at three hundred feet from its junction with the main post road; thence running for and keeping the east side of Liverpool River to Milton. This distance of ten miles is through a well-wooded but thinly-settled country.

Milton, two miles from Liverpool, although having distinct characteristics from the latter, may be considered as an extension of that town, and, judging from the appearance presented by its buildings, as well as the extent and resources of the mill privileges more or less made available for the manufacture of lumber, it is not the less important. The Liverpool River here, for a distance of nearly two miles, is a series of small lakes or pools, impounded by mill dams, and made to pay easy tribute of its strength on its journey.

The mechanical force thus stored and so aptly utilized by the predecessors of the present generation, for the manufacture and export of Lumber, proved so remunerative that comfortable homesteads, nestling in shady nooks, half embowered by trees and sombre woods, remain as a transcendant example of the fruits of industry, skill and perseverance.

SOUTHERLY SLOPE—SOUTH MOUNTAIN.

If we were to follow a course along the South-eastern or Atlantic slope of the South Mountain, keeping parallel with the trend of its summit and lower than the granitic outcrops, we would traverse a district of much interest which is known to few, and would find many places obscure and lonely, possessing great natural beauty and fertility. Along the southernmost slope, this belt, varying from ten to fifteen miles in width, is reticulated by many green patches of foliage and luxuriant growth of timber, exhibiting remarkable contrast with the barren denuded surface of a great portion of the country further down. If you would follow this varied yet regular range of landscape, alternating with lake and woodland, many strange phases of primitive grandeur would present themselves. Some noble forest trees of vigorous growth, some far gone in years, some shattered by the winds and frosts, bent and broken, lying athwart their neighbours, others long since departed yet still bolt upright with their bare white rampike branches atop, and here and there small clumps of new growth shewing all the beauty and vigour of youth. Further on is the "hardwood hill," with its stately white limbed birchen or maple, shewing smooth firm trunks and wide protection of bough, as regular and as trim as if pruned and trained by the expert to beautify some lawn or avenue in the frequented and ornamental parks of Europe. Rising from a carpeted floor of crisp leaves, at remarkably regular distances apart for their convenience of growth and development, these trees, indigenous, clothe receding hill sides for many miles. We notice that the lines are somewhat finely drawn between the domain of each of its kind, each generally keeping within its own boundary. There are, of course, many intervening patches of a mixed growth of pine, birch, maple and others, yet generally speaking, the first named three keep within the zones of their kind. Long vales of meadow, with a copious covering of grasses, frequently are met with. They generally encompass lakes, or border streams on alluvial or peaty surface, and often open up glades that permit the eye to range over a prospect beautiful and extensive. Rosignol, with its clustered islands, secluded and solitary, the largest of our inland lakes, is exceedingly pleasing and picturesque—here expanding into a broad sheet of limpid glow, there presenting narrow wavy outlines in the sombre shadows of islands that look as if afloat, and bearing mast like the spruce and hemlock which give them a trim and characteristic appearance; and again we come unawares on long winding armlets branching and converging with fringed borders of willow and alder, that dip their pendant branches into the water, all giving a semblance of vastness to this natural landscape scenery, that when once seen is not easily forgotten.

The Mic-Mac has for ages established this secluded retreat, commonly known as the Indian Gardens, as the centre of his hunting operations. Here in summer he can provide himself with fish, and in winter he is in the path of the Moose or Elk, that still roam at large and almost unmolested over the vast tract of wilderness. The Beaver, too, is still active in the lakes and swamps along this district, and although his domain, like that of the Moose, is fast becoming circumscribed, he yet furnishes some winter sport and employment to the hunter and trapper.

ART. IX.—NOTES ON NOVA SCOTIA FRESH-WATER SPONGES. BY A. H. MACKAY, B. A., B. SC.

(Read 12th May, 1884.)

About the middle of August, 1883, I spent a few hours examining the MacIntosh Lake, near the north-eastern extremity of the Cobequid range, and the Earltown Lakes, a little higher up on the same range, with the object of learning the nature of the deposits at their bottoms. Having extemporized a small raft on the former lake, I paddled out a little distance, and with my face close to the water, saw old branches of trees in the bottom, with patches of a thick green growth surrounding portions of them, sometimes bearing short finger-like projections. Drawing these up, I made my first practical acquaintance with a fresh-water sponge. On the hard, gravelly beach of a small