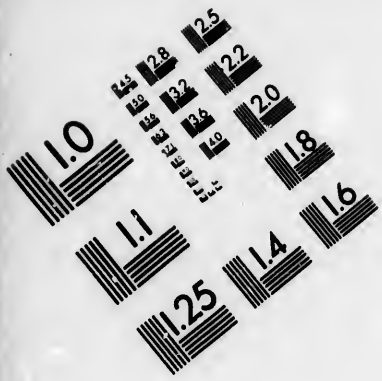

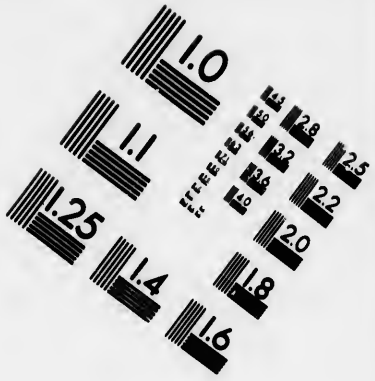

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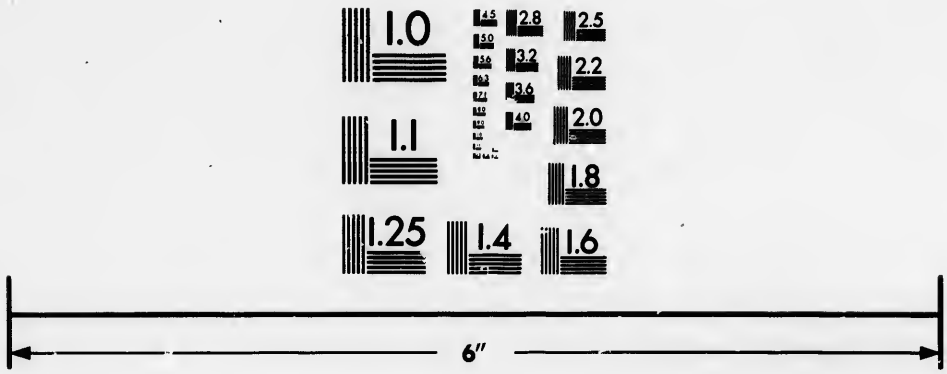

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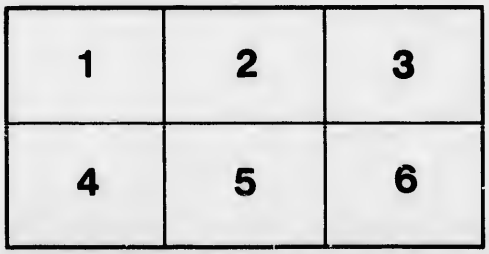

PETROLEUM

ITS GEOLOGICAL RELATIONS

CONSIDERED WITH ESPECIAL REFERENCE TO ITS OCCURRENCE

IN

GASPÉ

BEING A REPORT ADDRESSED TO

THE HON. COMMISSIONER OF CROWN LANDS

BY

T. STERRY HUNT, LL. D., F. R. S.

OF THE GEOLOGICAL SURVEY OF CANADA

WITH A GEOLOGICAL MAP OF A PORTION OF GASPÉ.

QUEBEC:
PRINTED BY G. E. DESBARATS.

1865.

1865
(19)

TO THE HONORABLE A. CAMPBELL,

COMMISSIONER OF CROWN LANDS,

Quebec, Canada.

SIR,

In a letter from the Assistant Commissioner dated Quebec, May 12, and addressed to me, as the person in charge of the Geological Survey of Canada during the absence of Sir William Logan, you have requested a geological delineation of the rocks in the oil-bearing region of Gaspé, and such a description of them as may serve as a guide to those searching there for available supplies of petroleum. Herewith I have the honor to transmit to you a geological Map of that region, and also a Report. In the latter I have thought fit to enter briefly into a consideration of the geological relations of Rock Oil, and the laws which regulate its distribution in various formations, since in no other way could the facts bearing upon the Gaspé

district be made so intelligible. I have in the second place, briefly considered the probabilities of a supply of petroleum in Lower Silurian rocks, such as those at the Grand Manitoulin, where oil springs are now attracting attention; and in the third place have proceeded to speak of Gaspé, giving, as not without interest, a brief history of the investigations by the Geological Survey in that region, together with a description of the occurrence of petroleum in that district, and a consideration of the probable results of explorations.

In all this I am indebted for the facts to the various Reports of the Geological Survey of Canada, and especially to the volume published in 1863, from which I have copied freely. For other suggestions, and for the theoretical considerations here presented, I am personally responsible.

The details of the map are copied from the General Geological map of the province now in course of publication.

I have the honor to be,

Sir,

Your obedient servant,

T. STERRY HUNT.

Office of the Geological Survey,
Montreal, June 15, 1865.

PETROLEUM

ITS GEOLOGICAL RELATIONS.

Petroleum, or Rock Oil, in different parts of the world, is found issuing from rocks of very various geological formations, of all ages, from the Lower Silurian to the Tertiary. In determining the origin of the oil in any given locality, however, we must always consider that the true source of it may be not in the rock which there appears at the surface, but in some underlying formation. Thus, in western Pennsylvania and in Ohio, although natural oil springs appear at the surface, many of the productive oil wells are sunk to depths of several hundred feet in the great Devonian sandstone, which there attains a thickness of nearly 2000 feet. In other places in that region they are sunk in the still higher Carboniferous rocks, which, in many parts, rest upon this sandstone. Coming northward into Canada, we find the oil wells of Enniskillen sunk in shales which, from their softness, are locally called soapstone, and at a depth of 200 feet or more rest upon a limestone formation known as the Corniferous limestone, which underlies a considerable portion of Western Canada.

From the Niagara river this formation occupies a narrow belt along the north shore of Lake Erie to the west of the Grand River,

after which its boundary runs north-westward, passing a little to the east of Woodstock, and thence more northerly to the shore of Lake Huron, near Point Douglas. The whole region to the south and west of the line thus indicated, is underlaid by the Corniferous limestone, which is covered only by the superficial clays and sands, except over a small area, where it is overlaid by the shales found in Enniskillen, Brooke, Warwick, and Bosanquet; these are in some parts overlaid in their turn by black bituminous shales, as at Kettle Point on Lake Huron. These black shales are erroneously supposed by some to have a relation to the rock oil of the region, the true source of which appears to be in the limestone formation below, in which the oil seems to have been originally formed.* In many places where this rock comes to the surface we find that it contains oil in its porous portions, enclosed in such a manner that it can only be liberated by fracturing the rock. Some conditions are then required to set it free from its confinement, and these are found in the cracks or fissures which have been produced by those movements of the earth's crust which have given rise to what are called anticlinal lines or axes of elevation. These, straining and fracturing the strata, favour the out-flowing of the oil. This liquid, moreover, being lighter than the water which everywhere penetrates these rocks below the water-level, naturally rises and accumulates along the crown of these anticlinals. This process is favored by the fact that the strata on either side of the anticlinal, dip in opposite directions.

If the fissures in the oil-bearing rock along the anticlinals are open to the surface, the oil will flow out and be lost. If, on the contrary, this rock be overlaid by higher formations of different

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*For an exposition of the author's views on the origin of Petroleum, the reader is referred to a paper on the subject in *The Canadian Naturalist*, for July, 1861, subsequently reprinted in the Report of the Smithsonian Institution for that year, and in the *Chemical News* of London. Also to his essay, intituled: "Contributions to the History of Bitumens, &c.," *American Journal of Science*, for March, 1863; and more briefly "Geology of Canada," pp. 526, 527.

texture, which have been exposed to the same strain along the anticlinal, irregular rents or fissures may occur in these, into which the oil will rise and accumulate, together with water and with gas, which follow the same law as the oil. The fissures being often more or less completely closed above by plastic clayey strata, which do not permit the oil to filter through, become reservoirs.

Another case may be that of overlying porous beds in which the oil finds a lodgment, and from the nature of the surrounding strata rests imprisoned. An instance of this was met with at Enniskillen, where above the soft shales, and beneath the surface clays was a gravel bed filled with oil, which had slowly come up from below, and been retained there perhaps for ages. This stratum was the source of the so-called surface wells, after exhausting which borings were sunk into the shales below, and at various depths often penetrated the irregular fissures or veins from which very large quantities of petroleum were obtained.

The petroleum which impregnates the porous Devonian sandstone of some parts of western New York, most probably comes like that of the Enniskillen gravel beds from the Corniferous limestone below, though it may possibly be indigenous in the sandstone, as it certainly is in the underlying limestone. Among other places in which oil has been observed at the outcrop of the Corniferous limestone, the following localities, cited in the *Geology of Canada*, page 378, may be noticed :—Horn's quarry in Bertie, Gravelly Bay in Wainfleet, near the village of Jervis, and also in the township of Rainham. Further to the north-west, in Kincardine, beds of this same limestone hold considerable quantities of solid bitumen or mineral pitch.

From these explanations it will be understood that besides an underlying stratum of oil-bearing rock, it is necessary that there should be undulations to fissure the strata and raise them from their horizontal position, and moreover closed-up cavities or porous strata to serve as reservoirs for the oil. Without this latter condition the oil would long since have disappeared, and it must be

remembered that the natural oil springs which have been flowing, though sparingly, for ages, have been wasting the original supply of oil, which when once exhausted can never be replenished.

We find over great areas of the oil-bearing limestone of Western Canada but insignificant quantities of petroleum, and the reason of this is that the strata are often nearly or quite horizontal, and have not the arrangement required for its accumulation, or that having the requisite structure, the openness of the rocks, or the absence of overlying strata has allowed it to run to waste. Thus at Tilsonburg where wells have been sunk in the limestone itself, which is covered only by a few feet of clay, the amount of oil is small; while in Enniskillen where the limestone is overlaid by more than 200 feet of fissured shales, which in their turn are covered by beds of gravel and clay, all helping to retain the oil, the wells sunk to various depths in the shales yielded in little over a year (1861–62) about 4,000,000 of gallons of petroleum, and still continue to furnish it though in less quantities. In Pennsylvania and Ohio the oil-bearing rocks which are near the surface in Canada West, dip beneath the great masses of Devonian sandstone and shale already noticed. These have furnished reservoirs for the oil, and hence the wells along the anticlinals in those regions are still more productive than those of Canada. These same oil-bearing rocks underlie a considerable area in western New York, and although they there afford in many places small quantities of petroleum, the productive wells are confined to a few districts in the adjoining states of Pennsylvania and Ohio, and according to Prof. E. B. Andrews, to those in which the rocks are somewhat disturbed; nor is there according to him a single productive well among the many there sunk in horizontal strata*.

* American Journal of Science for July, 1861, page 87. The relation of the anticlinals to productive oil wells was, it is believed, first pointed out by the present writer after a study of the oil region of Western Canada, in a lecture published in the Montreal Gazette of March 1, 1861; although as will be shown further on, Sir W. E. Logan had many years previously shown that the petroleum springs of Gaspé were along the line of a fold in the stratification. (Report on the Geology of Canada for 1844, p. 41.)

It thus becomes very important in searching for petroleum in an oil-bearing region to determine the position of the anticlinal axes. These are not necessarily marked by any irregularities of the surface, for the folded strata were ages since partially worn away by the action of the elements, and as the surfaces thus planed, and often sculptured into hills and valleys, are now covered over by sands and clays, which in western Canada, give us but few opportunities of seeing the rocks beneath, it is only by actual inspection of these at numerous points, and by the contours of the outcrops, that we can determine their attitude. It will be understood that the beds of rock on the two sides slope away in opposite directions, at a greater or less angle.

A careful study of the strata in the western peninsula of Canada shows that the main line of the great anticlinal fold of that region passes from the western extremity of Lake Ontario by Woodstock. Proceeding thence along the Thames, in the general bearing of the Great Western Railway, it would reach the town of Chatham, and then pass to Pigeon Bay on Lake Erie. (Geology of Canada, p. 379.) It should however be borne in mind that such a fold is often accompanied by subordinate ones more or less nearly parallel, which in some parts of their course may become of importance. Those familiar with the study of such undulations in regions where the rocks are more exposed, are aware how individual folds successively die out and are succeeded by others which are not in the same line, but parallel. The minute study of these undulations is evidently important in its bearing in the distribution of petroleum. The borings in Enniskillen show the existence of two folds of this kind to the north of the main anticlinal, at Oil Creek, and at Petrolia. In these places the underlying limestone is found nearer the surface than at an intermediate boring, thus showing two anticlinals, with an axis of depression or synclinal between. One of these is apparently connected with an anticlinal observed to affect the rocks of an older formation at Rockwood. The following observations showing the existence of other and minor undulations in the oil-bearing

limestone of this region, which may become of importance in connection with petroleum, are copied from the page of the Geology of Canada just cited.

"Small undulations in the Corniferous formation are observable at several places in that part of its distribution which borders on Lake Erie, from the Niagara River to the township of Windham. Two of these are indicated by curves in the outcrop of the base, one of them near Point Abino, and another obliquely crossing the Welland Canal in the second range of Humberstone; the course of both is probably about south-west. Opposite dips in some of the exposures of the strata indicate other undulations. One of these occur in the thirteenth lot of the range of Rainham, where the direction of the undulation is nearly north-west; and another is shown in the large exposure of Oriskany sandstone on the town-line between Oneida and North Cayuga, where the direction of the undulation is about south-west."

In addition to these undulations it will be seen by referring to page 363 of the work just quoted, that there is a synclinal depression running nearly at right angles to the line of the great east and west anticlinal, from Plimpton on Lake Huron to Oxford on Lake Erie.

The rareness of the outcrops of rock over much of this western region renders it difficult to trace out the various undulations. At the same time the considerable thickness of clay which covers up the rocks has tended to prevent the loss of the oil, and thus the wells sunk at Bothwell in the line of the main anticlinal, where clays, and probably also shales overlie the limestone, are now yielding considerable quantities of petroleum.

With regard to the prospect of finding oil in other parts of the province than that just mentioned it is to be remembered that there are two other geological formations in which petroleum has

been observed. To make more clear their relations it will be well to give the succession of the great divisions of paleozoic rocks, and their approximate thickness in western Canada—beginning with those highest in the series :

	Feet.
15. Portage and Chemung—sandstone.	
14. Hamilton—shales	230
13. Corniferous—limestone	300
12. Oriskany—sandstone	25
11. Gypsiferous—dolomite	300
10. Guelph— "	160
9. Niagara— "	250
8. Clinton—limestone and shales 7. Medina—sandstone	600
6. Hudson River—shales 5. Utica—shales	800
4. Trenton group—limestone	750
3. Chazy—limestone 2. Calciferous—dolomite. 1. Potsdam—sandstone	These in western Canada are represented by the Lake Superior sandstones.

Of the above series, the highest member, which constitutes the great sandstone formation in which many of the wells of Pennsylvania are sunk, is unknown in western Canada, or represented only by the black shales of Kettle Point, which are regarded as belonging to its base.

The thickness of the Corniferous limestone, No. 13, is variable; from 90 feet in western New York it increases to about 160 in the townships of Woodhouse and Townsend, and in Michigan attains 350 feet; so that we may with probability assume 300 feet for its thickness in south-western Canada.

After leaving this limestone formation we pass through, in descending, about 2000 feet, chiefly of dolomites (magnesian limestones), sandstones and shales, before reaching the Trenton group. This consists of pure (non-magnesian) limestone, like the Corniferous, and like this, too, holds petroleum, which has been observed

in several places under conditions similar to those in which this substance has been observed at the outcrops of the Corniferous limestone in the west. The points in Canada where petroleum has been seen in the Trenton group (which includes not only the Trenton limestone proper, but the Birdseye and Black River limestones of the New York geologists) are below Quebec at Rivière à la Rose, in Château Richer, and to the west of Montreal at Lancaster and Pakenham. In these places it fills cavities in the fossils, and flows out when these are broken. At Cornwall, also, a black matter resulting from the drying up of petroleum, is formed under similar circumstances. In very many other places the limestone is impregnated with small quantities of petroleum, the odor of which is apparent when the rock is struck or is heated.

The quantity of the oil is much less than in the Corniferous formation, and in no case as yet have petroleum springs been seen to flow from outcrops of the Trenton group. In western Canada and the adjacent States, however, we have seen that petroleum accumulates in the shales and sandstones overlying the Corniferous formation and appears at the surface of them; so, in several places, petroleum springs have been observed issuing from similar rocks which overlie the Trenton limestones. One which furnishes small quantities of oil has long been known at Guilderland, near Albany, New York, issuing from the shales of No. 6 in the above table; and one noticed some years since by Mr. Murray, as occurring at Albion Mills, near Hamilton, C.W., is from No. 7. Another locality now attracting attention is the Grand Manitoulin Island, where Mr. Murray, many years since, described petroleum as rising from the shales of No. 5. It is not improbable that in some districts the conditions of structure which have been described in the preceding pages may have permitted the accumulation of valuable deposits of petroleum, derived from the Lower Silurian limestones, which, as remarked by the present writer in an essay on petroleum, printed in the *Canadian Naturalist* in July, 1861, and republished both in the United States and in England, "may, in some localities, prove valuable sources of petroleum." It is further

remarked, in the *Geology of Canada*, page 788, that the *possibility* of the occurrence of available quantities of petroleum in some part of these lower rocks should not be lost sight of, although they have never yet furnished any considerable amount of it. This latter remark still remains true, and future trials, in the Manitoulin Islands or elsewhere, must determine whether these lower rocks, which underlie nearly all the champaign region of Canada and great portions of the United States, are destined to become sources of petroleum. It is, however, to be borne in mind that, so far as examined, these Lower Silurian limestones, which are extensively quarried, and constitute the most common building-stone from Kingston and Ottawa to Quebec, are less bituminous than the Devonian (Corniferous) limestone.

Small quantities of solid bitumen are occasionally met with in the Niagara limestone, and a solidified and altered bitumen in various localities in the Quebec group; but the Trenton and Corniferous limestones are as yet the only two formations of the great St. Lawrence basin in which petroleum or liquid bitumen seems to be indigenous.

PETROLEUM OF GASPE.

In the peninsula of Gaspé, however, which belongs to another and distinct eastern basin, petroleum has been met with in a geological position a little lower than that of western Canada. A great series, known as the Gaspé sandstones, there takes the place of the Devonian rocks numbered 12, 13, 14 and 15 in the preceding table, and attains a thickness of several thousand feet. Immediately beneath these sandstones is a limestone formation, unrepresented in western Canada, but coming between 11 and 12, and corresponding to what is known in New York as the Lower Helderberg series. These Gaspé limestones on the Dartmouth River attain a thickness of about 2,000 feet, and are occasionally found, like the Corniferous limestone, to hold liquid bitumen. They are in many parts covered over with the sandstones, but are brought to the surface along the lines of several anticlinals, whose positions are noted on

the accompanying map. Petroleum springs occur in numerous localities in the vicinity of the Dartmouth, York and Douglastown rivers, and although, in some instances, appearing on the outcrops of the limestones, are more generally found to issue from the overlying sandstones.

The first account of these limestones and sandstones, and of their distribution and relations, will be found in Sir W. E. Logan's Geological Report for 1844, pages 16–44. He has there described two petroleum springs, one on the south side of the St. John River, near Douglastown, and the other on a small branch of the Silver Brook, a tributary of the South-west Arm.

The exploration of this region, begun by Sir William Logan, was continued by Mr. Alex. Murray in 1845, when, among other things, he made a careful topographical survey of the Douglastown River for a distance of over forty-eight miles, and examined its tributaries, and also added many facts as to the rocks of the region and their distribution. (Geological Report for 1845, pp. 107–117.)

In 1857, Mr. James Richardson made an exploration of the Magdalen River from its mouth, and thence across to the York and Dartmouth Rivers, making several traverses in the interior, and adding further details to our knowledge of the region. (See the Report for 1857, pages 31–68, accompanied by a map of the region.) The results of their various surveys are set forth in detail in the sixteenth chapter of the *Geology of Canada*.

In 1862, Mr. Robert Bell, who had been an assistant to Mr. Richardson in his survey of 1857, was by Sir William Logan sent down to obtain additional details of the geology of this region; and the results of his examinations are set forth in the supplementary chapter to the *Geology of Canada*, (pages 880–886). Besides these he noted several additional localities in which surface indications of petroleum are met with; and these observations, together with the previous ones, are given in the extracts which follow below from the *Geology of Canada*.

In chapter xvi, after describing the southern anticlinal, which passes through Tar Point, and the curious greenstone dyke at this place, which from the strong odor of the petroleum that impregnates it, has given the name to the place—it is added—

"Two petroleum springs occur along the line of this anticlinal. One of these is on the south side of the St. John River, about half a mile above Douglastown. There, the oil rises from the mud and shingle of the beach, and is seen in globules rising through the water at high tide. Portions of the oil are said to have been observed under similar conditions as far as the extremity of the first marshy island, a distance of three fourths of a mile above; and they may probably extended much further in the same direction.

"The second spring was observed about 200 yards up a small branch of the Silver Brook, which is a tributary of the South-west Arm, falling into it about six or seven miles from Gaspé Basin. This orifice of the spring was not seen, but the oil, which is not observed higher up on the brook, here collects on the surface of quiet pools as a thick film. These two petroleum springs are nearly in a right line with the bituminous dyke, and in the direction indicated by the bearing of the latter, which is distant about twenty miles from the furthest spring. It is therefore likely that these occur along the line of the undulation, with which as we have already remarked, the dyke seems to be connected.

"The rock adjoining the dyke, and underlying both of these springs, is the sandstone; *but it is not improbable that here, as in western Canada, the source of the oil may be in the more fossiliferous rocks beneath; so that we may hope to find other springs of it, not only along the line of twenty miles just indicated, but still farther along this and other undulations in the same region, where borings and wells may furnish more abundant sources of petroleum.*" Page 403.

The following extracts will show that the first two previsions of the lines which we have italicized, have been fully justified

by subsequent examinations undertaken with that view. In chapter xvii it is stated, after alluding to the places just mentioned—

"Other localities of petroleum have since been observed in that vicinity, at the entrance to Gaspé Basin, and also near the north-east corner of the Douglastown Lagcon. About a mile and a half to the south-east of Gaspé Basin, and *on the line of the northern anticlinal*, is found a layer of mineral pitch or dried bitumen,* lying beneath the surface of vegetable mould, while the soil for some distance to the eastward is saturated with petroleum." Page 521.

In chapter xxi we are further told—

"Subsequent explorations have shown several additional localities of petroleum in the vicinity of Gaspé Bay. The limestones of this region, which are regarded as of Upper Silurian age, and referred to the Lower Helderberg group of the New York geologists, are observed at various points on the Dartmouth, York and Malbay Rivers to be more or less impregnated with petroleum. These limestones are generally dark bluish-gray, with layers and nodules of chert, and are traversed by numerous veins of white calcspar, sometimes including drusy cavaties. These often hold petroleum, which impregnates the calcspar, and is seen to rise to the surface where freshly broken fragments of the rock are thrown into the water. * * * * In many parts throughout this region, the limestone is overlaid by a sandstone, the lower part of which is regarded as of the age of the Oriskany formation. This rock near the mouth of the York River, is, like the limestone, impregnated with petroleum, and on the same river about twelve miles from the entrance to Gaspé Basin, small portions of solid bitumen were found in the cavities of a trap dyke cutting the sandstone. A similar dyke at Tar Point has already been described.

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* This is similar to the so-called *gum beds* of Western Canada. Geology of Canada, page 521.

" At the oil spring at Silver Brook (already mentioned above) the petroleum oozes from a mass of sandstone and arenaceous shale, which dips south-easterly at an angle of 13°, and is nearly a mile to the south of the crown of the anticlinal. The oil, which here collects in pools along the brook, has a greenish color and an aromatic odor which is less disagreable than that of the petroleum of western Canada. From a boring which has been sunk in the sandstone to a depth of 200 feet, there is an abundant flow of water, accompanied by a little gas, and by very small quantities of oil. Farther westward, at about twelve miles from the mouth of the river, oil was observed on the surface of the water at the outcrop of the limestone. Petroleum is met with at Adams's oil spring, in the rear of lot B of York, nearly two miles east of south from the entrance of Gaspé Basin. It is here found in small quantities floating on the surface of the water; and near by, is a layer of thickened petroleum, mixed with mould, at a depth of a foot beneath the surface of the soil. A mile to the eastward, at Sandy Beach, oil is said to occur, and again at Haldimandtown, where it rises through the mud on the shore. These three localities are upon the sandstone, and on the line of the anticlinal, which passes a little to the north of the Silver Brook spring. Farther to the south-east, on the line of the southern anticlinal, and about ten miles west of Tar Point, which takes its name from the petroleum found there, another oil spring is said to be found three quarters of a mile south of Seal Cove. On the south side of the Douglastown Lagoon, and about a mile west of the village, oil rises in small quantities from the mud on the beach. A well has here been bored to a depth of 125 feet in the sandstone, which dips to the south-west at an angle of 10°, but traces only of oil have been obtained. Farther to the westward, oil is said to occur on the second fork of the Douglastown River. Traces of it have also been observed near St. George's Cove, on the north-east side of Gaspé Bay.

" In none of these localities do the springs yield any large quantities of oil, nor have the borings, which have been made in two

places, been as yet successful. The above indications are however interesting, inasmuch as they show the existence of petroleum over a considerable area in this region, some part of which may perhaps furnish available quantities of this material." Pages 788 and 789.

No facts have come to our knowledge since the above lines were penned, two years since, which would lead us to modify the statements of the last paragraph. As has been pointed out in the preceding part of this paper, the existence in any oil-bearing region of available sources of petroleum, depends upon a a combination of many circumstances : (1) the proper attitude of the strata, (2) the existence of suitable fissures which act as reservoirs, and (3) such an impermeability of the surrounding and overlying strata as will prevent the outflowing and wasting of the accumulated oil. Of these conditions we find in the oil-bearing rocks of Gaspé numerous undulations causing anticlinals or axes of elevations, and along such lines the usual fissures and openings are doubtless not wanting. The numerous oil springs met with at the surface of the soil are so many evidences that these conditions have favored the accumulation of petroleum ; but whether these springs are but the oozings from full reservoirs ready to yield a copious supply to the skill of the laborer, as in many parts of the United States and Canada, or whether, as in other places, they are the last drainings from former accumulations well nigh exhausted by the waste of ages can only be determined by trial.

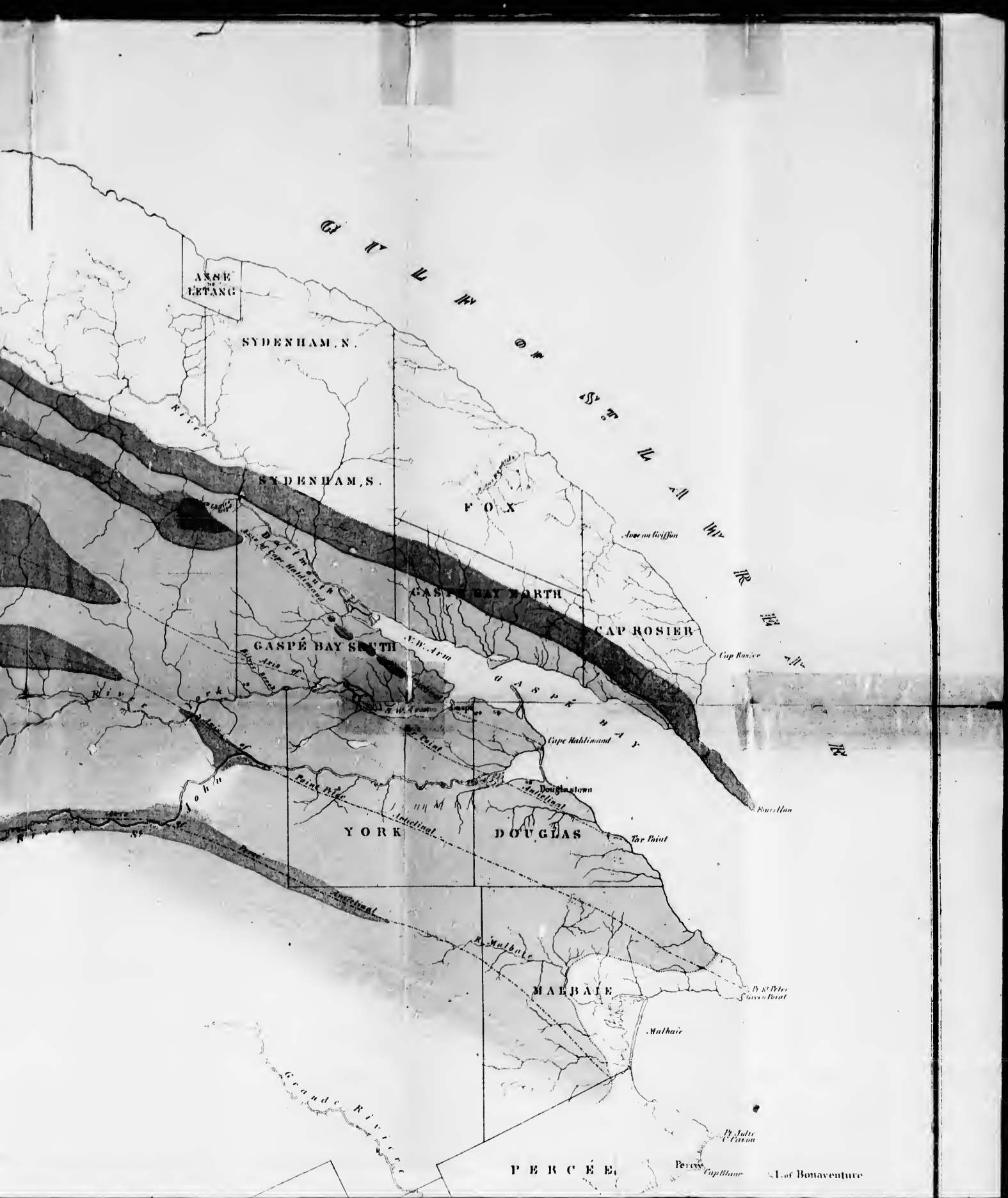
The failure of the few wells hitherto sunk in Gaspé should not be regarded as discouraging, for it has been found elsewhere that of two wells, one may strike a fissure or vein of oil at no great depth, while another well, near by is unsuccessful, or only reaches the oil at a much greater depth ; a fact due to the irregularity and obliquity of the fissures. As regards the site of natural oil-springs, it should be considered that the petroleum may often pass a considerable distance in a nearly horizontal direction beneath impermeable strata, and finally come to light at some distance to one side of the reservoir. The thickness of the sandstone in this region,

where it attains 4000 feet (and even 7000 feet in its greatest development,) is doubtless considerable even on the crests of the anticlinals, and deep wells must be sunk along these lines before the presence or absence of available supplies of petroleum in this region can be ascertained.

It is to be remarked that in the great thickness of the sandstone which overlies the oil-bearing limestone of Gaspé, there is a close resemblance to the conditions existing in western Pennsylvania and Ohio, where the productive oil wells are sunk in a similar great sandstone formation, several thousand feet in thickness, which there overlies the Corniferous limestone, and, as we have endeavoured to show, has been favorable to the accumulation and preservation of the petroleum derived from this lower formation. The sandstone formation in Gaspé covers a large tract of country, extending as far west as the Matapedia, and it is not improbable that petroleum may be met with in other parts of its distribution than those in which its presence has already been detected.

It remains to be added that this great region is as yet but partially surveyed, and that the position of the anticlinals on the accompanying map, is, for some parts of their course, to be regarded only as approximative.


River Magdelena


GULF OF ST. LAWRENCE
ANSE AU LETANG
SYDENHAM, N.
SYDENHAM, S.
FOX
GASPÉ BAY NORTH
CAP ROSIER
GASPÉ BAY SOUTH
GASPÉ BAY
YORK
DOUGLAS
MARBAIE
PERCÉE
Cape Rosier
Cape Mahlimaud
Douglastown
Tar Point
Malbaie
Percé
Cap Blanc
I. of Bonaventure


NEWPORT
PORT DANIEL
Port Daniel
HAMILTON
COX
HOPE
Paspebiac
New Carlisle
Roberts & Reinhold, Chromo-Li

GEOLOGICAL MAP

OF A PORTION OF

GASPÉ.

Scale 1 Inch to 4 Miles

To accompany a report on the Petroleum of that region.

The Geology is furnished by the Geological Survey of Canada. Sir Wm E. Logan. L.L.D. F.R.S. Director.

EXPLANATION OF COLORS

- *Gaspé Sandstone — Devonian.*
- *Gaspé Limestone — Upper Silurian.*
- *Serpentine of the Quebec group — Lower Silurian.*

Roberts & Reinhold, Chromo-Lith. Montreal.