

compact gypsum of Antigonish has quite the character of alabaster. I have only seen small pieces but probably larger ones are to be got. The quality of this as a material for carving was shown at the Dublin Exhibition, it proved excellent. A small piece was carved to represent a bunch of grapes and some leaves by Mr. C. Harding, of Windsor, whose skill and taste in another department of fine art, viz : pen and ink drawing, have contributed materially to the adornment of the Nova Scotian Courts in both the late Exhibitions. It came under my own notice that both the carving and the material, attracted the attention of a wood-carver and called forth the expression of his favourable opinion.

In the Provincial Building now being erected, an opportunity offers for testing the value of native materials in internal decoration, and perhaps the public voice will be heard in favor of embracing it as the matter is surely one of Provincial interest.

ART. VIII. REMARKS ON THE PITCH LAKE OF TRINIDAD. BY
REV JOHN MORTON, LAHAVE.

[*Read March 8, 1866.*]

THE Pitch Lake of Trinidad lies on the western side of the island and about a mile from the Gulf of Paria. It is nearly circular, and about three-fourths of a mile across. There is no point from which a view of the whole lake may be obtained, as it is broken in upon by islands and obtruding points. These lie principally about 400 yards from the western side of the lake ; and from these the view easterly is very striking, and relieves the disappointment which is generally felt upon the first view of the lake. The expression *lake* is apt at first to mislead. The pitch is not in a fluid state, except in a very small spot, and may be safely walked upon over all the rest of the lake. Indeed teams might be driven over a great part of it, although any heavy weight left on it would gradually sink. The pitch, which from the heat of the sun and probably also from subterranean fire, is hot all over the lake, becomes hotter as you approach a point near the centre, where it is simmering and boiling over very gently. You can safely advance to the very edge

of this spring and obtain a specimen, care being taken not to burn the fingers.

The surface of the lake is intersected by little canals, particularly on the western side. Some of these are shallow and narrow, others are three or four yards wide and from three to five feet deep. The edges of these canals are rounded like the lips of an ancient urn. And they seem to have been formed by the pitch, which had boiled over from different springs, having met and cooled. Where the springs have been near each other the overflowings have run together, so that their meeting can scarcely be traced. But where they have been more distant the pitch waves have had time to cool somewhat before meeting, and thus hardened have met at the bottom without running into each other, and the interval between their edges forms a deep canal, wide at the surface and rounding down to a crack at the bottom, where the overflowings have met. Lips more or less gently closed may serve to illustrate the shape and varieties of these canals. They are always full of water. We enjoyed a tepid bath in some of the deepest and found them of the same shape as the others. None of these canals intersect each other; but where overflowings from three different springs have met, three canals are formed, deepening in their course until they converge into a deep triangular pool. The pitch does not always boil at the same part of the lake, nor always with the same activity. And these overflowings point to a time when the pitch springs have been near the western side of the lake, and perhaps more than one of them active at the same time.

The western side has a shore or border of pitch, sloping more or less gently towards the lake, indicating a depression in its level. The eastern side presents a different appearance. Here the soil covered with grass and bushes comes close to the lake. The lake itself is smooth, and the canals on its surface few and small, indicating a greater internal heat. At the edge of the lake the soil is only a few inches deep, and the land is very level, and seems really a continuation of the lake with a superjacent shallow layer of earth. This is confirmed by appearances further inland, where the formation can be traced for about six miles. If, as we conjecture, the land here rests, for some little distance, upon the pitch in a soft and but little inspissated condition, it is easily seen that on a subsi-

dence of the lake, the land floating upon it would subside with it, without altering the appearance on the surface. Whereas on the western side, the solid formation adjoining the lake would hold its position, and thus indicate the subsidence of the lake in a shore such as that to which we have referred.

From the western side of the lake, the land descends without interruption to the Gulf of Paria. In this slope there is a very gentle depression, beginning where the shore of the lake is least elevated, and where it appears even now almost ready to overflow, and traceable to the Gulf, where the pitch is found exposed along the shore, and forms a point that stretches into the Gulf about 400 yards. Here the appearances are of a nature not to be misunderstood. The pitch is exposed for about a quarter of a mile along the shore, and in some places for several rods above high water mark. And it is clear that it has not been thrown up by the tide, as some have asserted, but has flowed from inland. The flowings are as distinctly marked as if they had occurred but yesterday. The manner in which they have been turned aside by obstructions and their uniform slant, together with the clearly marked edge where the flowing has cooled, admit of no doubt in this matter. In the bight formed by the point of pitch which juts out into the Gulf, the beach is wholly of pitch; it is very steep and has the rounded contour of the edge of a large pitch wave, as if it had been here arrested in its progress and cooled by the tide. Southerly from the point of pitch the beach becomes more level, and is covered with black pebbles, in some places to the depth of a foot. These on examination prove to be pitch and scoria rounded by the action of the tide. Passing on we find a well defined flowing that seems to have hardened before it reached the tide. Here the land rises abruptly, the beach becomes sandy, and we lose all traces of the pitch.

A public road enables us to trace the formation up the depression of which we have spoken, the whole way to the lake. In some places several feet of soil overlies it, but as you approach the lake the soil becomes shallow and has been washed from the road by summer rains, leaving the pitch quite exposed for a considerable distance. All along the road and particularly where the pitch is thus extensively exposed, the hardened overflowings are as well defined as on the shore. Their appearance is well illustrated by what

may be seen on many hill sides during our Nova Scotian winter, where water has congealed in successive overflowings. The conclusion is inevitable, that the Pitch Lake has been, and is still to some extent, an immense Pitch spring or series of springs, and that the depression from the western side of it to the shore of the Gulf of Paria, is the bed down which the products of this vast spring has at one time flowed, causing the appearances on the road and on the shore, and pressing out into the Gulf has formed the point of pitch above referred to.

I have not been in a position to consult any standard geological works on the subject except Sir Charles Lyell's. And as my object was not to compose a scientific essay, but merely to accompany the specimens with a few remarks, I have confined myself to the result of my own observations.

Sir Charles' works contain little on the subject. In his "Principles" (p. 250, 9th ed.) he says :

"Fluid bitumen is seen to ooze from the bottom of the sea, on both sides of the island of Trinidad, and to rise up to the surface of the water. Near Cape La Braye there is a vortex which, in stormy weather, according to Capt. Mallet, gushes out, raising the water five or six feet, and covers the surface for a considerable space with petroleum, or tar ; and the same author quotes Gumilla as stating in his 'Description of the Orinoco,' that about seventy years ago, a spot of land on the western side of Trinidad, near half-way between the capital and an Indian village, sank suddenly and was immediately replaced by a small lake of pitch, to the great terror of the inhabitants."

"It is probable," says Sir Charles in continuation, "that the great pitch lake of Trinidad owes its origin to a similar cause."

When on the spot I was not aware that such statements had been published, and consequently made no special enquiry about them. But I never heard anything corroborative of them, except that bitumen was sometimes seen in small quantities floating near La Brea. Such a *vortex* as Capt. Mallet speaks of would be too notorious to be overlooked by persons living there, when answering the enquiries of strangers respecting the wonders of the place. Nor did I ever hear of a *small pitch lake*, such as Gumilla speaks of. His location

of it is very indefinite, and points as much to the great pitch lake, as to any place on the whole western coast.

The town of San Fernando, is about twenty miles N. of LaBrea. A hill rises abruptly, behind the town, to the height of upwards of 1000 feet. The cutting of a road, across a spur at the north side of this hill, lays bare a surface of pitch. It is very hard and has the appearance of having been thrown out of place by some convulsion. The valley of the Naparima, extending inland some nine miles and about four miles in breadth, is well cultivated, and a tramway runs up through it, in laying which several considerable cuttings have been made, but no pitch has been any where discovered. From this and from the fact that there are decided indications of volcanic action on the hill, it seems probable, that the pitch has been here thrown up from a considerable depth, by volcanic action; and that the formation extends over a considerable part of the W. side of the island, from the middle to the southern ranges of mountains, flowing out at LaBrea, underlying the surface further north, and thrown up by volcanic action at San Fernando Hill. All this part of the island is subject to volcanic action. At Pointa Pierre six miles N. of San Fernando, there are hot springs; and in the forest twelve miles east, I visited some small but very interesting and active mud volcanoes.

Near the southern range of mountains, sulphur has been found almost in a pure state, reminding one of a similar connection of pitch and brimstone at the *Lacus Asphaltides*, under which the slime pits, or bitumen wells, of the Valley of Siddim, continue to throw up their products, and on whose shore brimstone is found in large quantities.

The pitch of Trinidad is manufactured on the Island, with common coal, and then used for raising steam. M. Stollmeyer, is largely engaged in manufacturing it for paving, or flooring stores; it being preferable to wood where insects are so troublesome and destructive. But it is scarcely hard enough for paving streets in so hot a climate. It is largely shipped to France and Hamburg, for paving. The pitch for shipment, is raised at the point that runs out into the Gulf of Paria, whence it is conveyed in boats to vessels anchored a few hundred yards off. The pitch here, being more inspissated than at the lake, is better adapted for conveyance in large

quantities. Much of the pitch manufactured on the island is taken from the lake. When thrown into heaps it runs together into a solid mass. And the place from which it is taken, although near the side of the lake where the pitch is hardest, gradually fills up again by the pressing in of the surrounding mass. The supply being so large and so easily attainable, it must continue for ages of vast economic importance.

ART. IX. ON SOME RECENT IMPROVEMENTS IN THE AMALGAMATION PROCESS FOR EXTRACTING GOLD FROM QUARTZ. BY GEORGE LAWSON, Ph. D., L. L. D., *Professor of Chemistry, Dalhousie College.*

[*Read March 8, 1866.*]

THE paper was chiefly occupied with a discussion of the properties of the metal SODIUM, (Na.) and of the Sodium Amalgams, and of the use of the latter in promoting the amalgamation of Gold.

The metal sodium, a discovery of Sir Humphrey Davy, was particularly described, and the method of removing it from its combination with oxygen. It was prepared by decomposing carbonate of soda by means of charcoal, at a high temperature, this last having a greater affinity for oxygen than sodium. The use of sodium in the arts has so diminished its price that it can now be obtained at 6s. stg. per lb. Specimens of large size, contained in naphtha, were exhibited. Its colour is silver white, sp. gr. 0.972—it is as soft as butter at the ordinary temperature of the atmosphere, fuses at 194°, and oxidizes rapidly in air. It burns on a slight increase of temperature. Several interesting experiments of its fusion and burning were exhibited. It decomposes water rapidly, uniting with the oxygen it contains, and liberating the hydrogen. The Doctor illustrated its action on water by some beautiful experiments,—amongst others, by the preparation in course of a few minutes of a large jar of hydrogen gas, by the action of sodium upon water; the hydrogen was afterwards exploded to show the converse of the experiment. The property of sodium in promoting the action of mercury and amalgams upon other metals had been known for many years. Recently, however, Mr. Crooke, F.R.S., a distinguished chemist, who had discovered the metal thallium, has applied sodium