

hollow drill that has been proposed for boring holes in rock through which a current of water is forced to carry off the ground stone, and still more, the production of pot holes on our coasts and in the hard beds of many rivers, by the moving water turning a stone in a hollow and so gradually deepening it, until through time a cylindrical and deep cavity is formed. A lake basin is an immense pot hole, in which the mass of ice that filled it took the place of the moving stone, its grinding power vastly increased, and in great part due to the moving glacier above it. The eroding action would be slow, but it would be continuous, and the only limit in depth to its power would be when the hydrostatic pressure of the water equalled the weight of the superincumbent ice, a limit far beyond anything with which we have to deal. The rock basins of Nova Scotia are much shallower than those of Italy and Switzerland, because in the one case the rocks operated on have been hard metamorphosed schists and quartzites, in the other soft molasse, easily eroded; the work done being proportional to the hardness of the material.

---

ART. IX. ON SOME BRINE SPRINGS OF NOVA SCOTIA. BY  
HENRY HOW, D. C. L., PROFESSOR OF CHEMISTRY AND NAT.  
HIST., UNIVERSITY OF KING'S COLLEGE, WINDSOR, N. S.

[*Read March 6, 1865.*]

IN a former communication to the Institute,\* and in another paper,† read before the Natural History Society of Montreal, I have given the composition of some of the mineral waters of the Province, known or reported to possess medicinal properties. Nearly all those analysed had for their leading ingredient sulphate of lime, or plaster, as it is called, the exceptions being a brine from the neighborhood of the Renfrew gold diggings, and that interesting water from Bras d'Or, of which the chief constituents were common salt and nearly as much chloride of calcium. In the discussion which followed the reading of my paper at the Institute, several springs were mentioned as locally famous, viz., those of Earltown, Shubenacadie, and a place a mile and a half east of Shelburne; but I believe no facts bearing on the composition of

---

\*Trans. N. S. Inst., Vol. 1.

† Canadian Naturalist, Oct. 1863.

their waters were made known. As regards the waters yet examined, those adverted to above contain so much sulphate of lime, and so little of other substances, that they might almost be made to form a distinct group; and the Bras d'Or water is one of a very remarkable class,\* called strongly saline, differing from brines in holding an amount of earthy chlorides equal or superior to that of common salt, which in true brines is of course the characteristic and exceedingly preponderating ingredient. It is well known that many of these true brines exist in the Province, but no analysis has yet been made, or at any rate published, of any of their waters. In the present paper, I give the results of my analysis of the waters of two brine springs (one of which I have made the subject of a communication to the Chemical Society of London), with information respecting the localities in which they rise, and place also upon record some notices of other brine springs with which I have been favored.

Brine Springs, Walton, Hants Co. My attention was drawn to one of these springs last May, when I was on a prospecting expedition in the neighborhood, by Mr. Joseph W. Stephens, who assisted me in collecting some of the water, and who subsequently kindly furnished me with interesting details of information. The spring issues on the west bank of the Petite River, a short distance from Walton bridge. It always has a considerable flow of water, which is clear and has no odour. The water has never been known to freeze; its temperature was  $44^{\circ}$  Fah. on a warm day in winter when the air was  $46^{\circ}$ . At all times in winter, even in the very coldest weather, there is about an eighth of an acre of the ice in the river quite soft and rotten, into which the spring water flows, and where the water actually enters the river it is never frozen. Mr. Stephens threw a piece of ice into the spring in January, and was astonished to see how rapidly it melted. The water is evidently somewhat thermal. It appears not to have been put to any medicinal use. The water collected by myself, having been kept in a well-corked bottle, was analysed in December, when it gave the following results: the imperial gallon contains —

---

\* Geology of Canada, p. 563, and C. News, x, 181.

	Grains.
Carbonate of Lime.....	14.73
Carbonate of Magnesia (very small).....	undet.
Carbonate of Iron .....	traces.
Phosphoric acid, decided .....	traces.
Chloride of Magnesium .....	4.48
Sulphate of Lime.....	161.16
Chloride of Sodium.....	787.11
	967.48

There is probably a small amount of chloride of potassium contained in the common salt, and it is quite possible also that there are traces of other constituents, which were not sought for in the small quantity of water at my command. A very interesting feature in this brine, illustrating the differences which obtain between the composition of waters as they issue from the earth, and that of the ocean which exhibits the results of numerous chemical changes, is the very large quantity of sulphate of lime present along with the salt, which, however, is still by so much the principal ingredient that the water is a true brine. In sea water, according to the elaborate researches of Forchhammer, extending to several hundreds of analyses,\* the maximum ratio of chlorine to sulphuric acid and to lime *in the open ocean*, is—

100 chlorine to 12.09 sulphuric acid, and  
100 chlorine to 3.16 lime;

in the Walton brine we have

100 chlorine to 19.7 sulphuric acid, and  
100 chlorine to 15.4 lime.

This water in fact contains almost exactly as much sulphate of lime (161 grains) as pure water would dissolve (*viz.*, 163 grains) if saturated. Since some of the waters of the Province, *viz.*, those of Wilmot and Spa Spring, Windsor, to which curative properties are attributed, contain this substance as by far the most abundant ingredient, experience may yet show the Walton brine to be also valuable to invalids, although sulphate of lime has not, I believe, as yet been recognized as a useful medicinal agent.†

Brine Spring, Salt Springs, Pictou Co. For a quantity of water from this spring I am indebted to the Rev. A. McKay, who occu-

\* Proceedings of the Royal Society, C. News, x, 293.

† Mr. Stephens informs me that on the other side of a ridge of land rising just above the Walton Spring just described, at a distance of two miles and a half, and on the descent of the ridge, a second brine spring is said to exist.

pies the Manse at the locality, and who kindly furnished me with the following information:—

“Last spring there was a great freshet, and the river made its way into the principal spring. I waited, expecting to have the river turned into its wonted channel, but being from home on a mission to Cape Breton at the time the river was lowest I did not succeed. There has been a hole dug in the end (?) of a low bank about nine yards from this main spring, by a company, about twenty years ago, who made salt from the water which came up there. This hole is ten or twelve feet deep. The water does not overflow here. From this spring I took the water sent to you. I also sent a piece of the rock jutting out between this hole and the main spring. There are several small springs about this low bank, over the length of about 150 yards. The salt water oozes out in many places along this course, and salt is deposited in some places.

“The water is used for rheumatism, and in so far as used I believe it has proved an effective cure. It is applied externally.”

On examining the water, I found that there was a very large quantity of salt present, along with much sulphate of lime. When received (September 9th) the water was without odour, but on standing for some time it smelt strongly of sulphuretted hydrogen, from the reduction of the sulphate by organic matter. Under these circumstances, in order to obviate considerable error, the principal ingredients were estimated at short intervals, but of course, since an accurate analysis could not be made of a liquid constantly changing, I can only offer the following results as exhibiting the approximate composition of the brine. An imperial gallon contained—

	Grains.
Carbonate of Lime.....	3.775
Carbonate of Magnesia.....	2.932
Carbonate of Iron.....	.181
Silica.....	.560
Sulphate of Lime.....	154.730
Chloride of Magnesium.....	27.330
Chloride of Calcium.....	51.910
Chloride of Sodium.....	4133.500
Phosphoric Acid, } Boracic Acid, } Bromine, } Organic matter, }	undetermined.

---

4374.918

Specific Gravity at 53° Fah.....1046.69

There was probably a small amount of chloride of potassium contained in the common salt. With regard to the bromine, the

evidence of its presence was very decided, the quantity was quite large enough to admit of determination, but the trouble involved in the exact estimation of this element is really so considerable that I contented myself with qualitative results. No doubt this valuable substance exists in other brines of the Province, but it has not before been proved to be present. It is from brines that most if not all the bromine of commerce is obtained. Boracic acid was found by evaporating somewhat less than a third of a gallon of the water, when it was perceived to exist in distinct traces. The presence of this acid is particularly interesting; it is probable or at least possible, that if due search were made most if not all the brine springs of this Province which rise in the lower carboniferous rocks would be found to contain it. I have already shown\* the existence of boracic acid (in two minerals), and also of a small quantity of rock salt, in the gypsum of Windsor, and now we have the same association observed in water from rocks (most probably) of the same formation at a distance of some 60 miles. When I detected the borate in gypsum, the late Dr. Robb, of Fredericton, strongly advised me to search waters issuing directly from the plaster rocks for boracic acid: the interest attaching to such an enquiry is increased by the result now brought forward. Gypsum is often associated with rock salt in other countries, and it is found with boracic acid (in the mineral boracite) in Germany.

Brine Spring, Sutherland's River, Pictou Co. For information respecting this spring, I am indebted to Rev. Dr. Honeyman; the water issues in the bed of the river, so that it can only be got at in the dry season; the outlet is situated a little above the falls due to disturbance of rocks which are probably lower carboniferous. The spring was discovered by persons observing cattle to drink at it, and it is now much resorted to and its waters are drunk for a variety of diseases.

Salt Pond, Antigonish. Dr. Honeyman informs me that salt was formerly made from this pond, and that a bathing house exists here: the region is lower carboniferous.

Brine Springs at Whycogomagh, Cape Breton. Of these, Dr. Honeyman tells me there are two, of which one is medicinal and the other is employed in the manufacture of salt. They rise in

---

\* Silliman's Journal, Sept. 1857, and July 1861.

lower carboniferous rocks, and at about a mile from the medicinal spring is situated the "salt mountain," supposed to be so called from a salt spring which issues from it. H. Gesner, Esq., informs me that this spring is not strongly saline. I learn from Dr. Honeyman that there is in this district another spring of a highly gaseous character, which is continually sending off bubbles of gas, carrying up a fine sand; its water is not saline but sweet to the taste.

Brine Spring, 12 miles from Bedeque. H. Gesner, Esq., informs me that a very strong brine, affording one bushel of salt to the hundred gallons of water, or six per cent. of salt, is found on the north side of the St. Patrick's Channel.

From what we see of the number and distribution of the brine springs of the Province, mentioned in this paper and elsewhere, the manufacture of salt may be expected to become a considerable branch of industry. The composition of the brines issuing from the lower carboniferous rocks is favourable to the manufacture, if, as may be supposed, they all resemble those of which the analysis has just been given, in containing sulphate of lime as the most abundant ingredient next to salt. As this is a substance not readily dissolved by water, it will separate almost entirely from the brine on boiling down to a certain stage, and the deposit on further evaporation will be table salt of considerable purity. Bromine of course, if present, will be found in the fluid from which the salt has deposited.

## ART. IX. ENQUIRY INTO THE ANTIQUITY OF MAN.

BY WM. GOSSIP.

[*Read March 6, 1865.*]

THE evidence relied on by geologists who endeavor to carry back the antiquity of man to an era far beyond the historic, is gathered from strata of the tertiary period, in which, associated with remains of extinct animals, are flint implements and weapons, similar to those which are known to be of the recent period; and from cavern deposits, in which the remains of man are found, mingled with those of other animals, the species of which it is supposed did not come down to the chronologic or historic age.

Geology, however, reveals no data to establish positive conclu-