
ART. 8.—Notes on the ANALYSIS of the GEORGIAN SPRING-WATER. By ARCHIBALD HALL, M.D., Lecturer on Chemistry, University of McGill College, Mem. Nat. Hist. Soc. of Montreal, and Cor. Mem. Lit. Hist. Soc.

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QUALITATIVE ANALYSIS.

- 1.—No change effected on either Litmus or Turmeric Papers ; indicating the absence of free Carbonic Acid or Alkaline Carbonates.
- 2.—Sulphuric and Oxalic Acids produced slight effervescence, the latter accompanied with a precipitate ; indicating the presence of an Earthy Carbonate.
- 3.—Oxalate of Ammonia and Oxalate of Potassa caused a speedy precipitation.
- 4.—The addition of Muriate of Baryta, was attended with slight cloudiness and subsequent precipitation, soluble partially in Nitric and Muriatic Acids with effervescence, thus giving evidence of the presence of Sulphuric and Carbonic Acids.
- 5.—Nitrate of Silver caused a dense curdy Precipitate, soluble in Ammonia ; indicating Muriatic Acid.
- 6.—Carbonate of Ammonia having been added in excess, and subsequently Phosphate of Ammonia, and the whole

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boiled, a copious precipitate was the result. The substitution of Phosphate of Soda for the Phosphate of Ammonia, in another experiment, produced a similar effect ; indicating Magnesia.

- 7.—On boiling the water, for a quarter of an hour, a white deposit coated the flask, which dissolved in Muriatic Acid with effervescence ; indicating the presence of an Earthy Carbonate.
- 8.—After evaporating a portion of the water, until a pellicle formed on the surface, cubic crystals began to deposit themselves. Some of them were dissolved in water and Muriate of Platinum added—no precipitate occurred, thus proving them to be Soda.
- 9.—A quantity of the water was reduced to $\frac{1}{15}$ th of its bulk, Starch and Sulphuric Acid were added, while Chlorine water was made to float on the surface. At the point of junction between the liquid and the supernatant Chlorine water, a faint purple streak became visible ; indicating Iodine.
- 10.—Treating the residuum, after evaporating ten ounces of water to dryness, by Muriatic Acid, disclosed a minute portion of insoluble matter, which was Silica.
- 11.—The Specific Gravity of the water from various experiments was 1.007.

From these experiments, the presence of the following ingredients is demonstrated :—

From Experiments, 2, 4, 7	.....	Carbonic Acid.
3	.....	Lime.
4	.....	Sulphuric Acid.
5	.....	Chlorine.
6	.....	Magnesia.
8	.....	Soda.
9	.....	Iodine.
10	.....	Silica.

QUANTITATIVE ANALYSIS.

- 1.—An eight ounce phial was procured, accurately balanced, and into it was poured 1,000 grains of the water. It was allowed to evaporate to dryness and the phial kept exposed to the heat for an hour, or until it was sensibly dry. On being weighed a second time, it was found to have increased in weight by 11·50 grains, which consequently is the amount of Anhydrous Salt in 1,000 grains of the water.
- 2.—1,000 grains of the water were treated with Nitrate of Silver. The Chloride of silver, washed, dried, and fused, weighed 25·5 grains; a quantity equal to 6·296 grains of Chlorine.
- 3.—4,000 grains were heated, and Oxalate of Ammonia added; the precipitate was carefully washed and dried in the open air; it weighed 3·75 grains, equal to 0·937 grains Oxalate of Lime to 1,000 grains of water, a quantity proportional to 0·412 Lime.
- 4.—To 1,000 grains of the water, freed from Lime, by Oxalate of Ammonia, a solution of Carbonate of Ammonia was added in excess, and, afterwards, a few drops of Phosphate of Ammonia. The Ammoniaco-Magnesian-Phosphate thus obtained, weighed 2·25 grains; equivalent to 0·660 grains of Magnesia.
- 5.—To 1,000 grains, Muriate of Baryta was added; the precipitate, after careful washing and drying, weighed 1·50 grains, consisting of Sulphate and Carbonate of Baryta. Having been exposed to the action of diluted Muriatic Acid; the residuum, washed and dried, weighed 0·90 grains, thus giving 0·60 grains as the weight of the Car-

bonate ; these yielded, respectively, 0·30 grains of Sulphuric Acid and 0·132 of Carbonic Acid in 1,000 grains of water.

- 6.—1,000 grains of the water were freed from Lime, Magnesia, Carbonic and Sulphuric Acids, in the manner stated, and Carbonate of Ammonia was added to precipitate any excess of Barytes remaining in the water. The whole was carefully filtered and evaporated to dryness, and the residue was kept at a red heat for an hour. It weighed about 7·20 grains, and was Chloride of Sodium, equivalent to 2·880 grains of Sodium. :

No experiment was tried to estimate the quantity of either the Iodine or the Silica. They were both in such minute quantities, that no good practical end would have been secured by it.

From these experiments the quantities of the different ingredients were as follows :—

From Experiment	2 Chlorine.....	6·296
	3 Lime.....	·412
	4 Magnesia	·660
	5 { Sulphuric Acid....	·300
	{ Carbonic Acid	·132
	6 Sodium.....	2·880
		Grains 10·680

These constituents were probably combined in the following manner :—

Muriate Soda	7·20	}	Chlorine	4·32
			Sodium	2·88
Muriate Magnesia....	1·848	}	Chlorine.....	1·188
			Magnesia	0·660
Muriate Lime	0·269	}	Chlorine	0·151
			Lime	0·118

Sulphate Lime	0·510	}	Sulphuric Acid	0·300
			Lime	0·210
Bicarbonate of Lime	0·216	}	Carbonic Acid	0·132
			Lime	0·084
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	10·043			10·043
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Differences will be observed in the aggregate amounts given in the course of the experiments; but, we must observe, that they were conducted with an apparatus, by no means sufficiently delicate for such nice experiments; and, in consequence, errors are not only easily made, but become, also, extremely difficult of detection. The analysis, however, is sufficiently accurate for all practical purposes. It indicates highly laxative properties—effects amply corroborated by experience.

The contents in an imperial gallon of 277·274 cubic inches will be as follows :—

Muriate of Soda	Grains	504·007
Muriate of Magnesia	,,	129·361
Muriate of Lime	,,	18·830
Sulphate of Lime	,,	35·700
Bicarbonate of Lime	,,	15·120
Hydriodate of Soda	,,	0·500
Silica		a trace
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Grains		703·518
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The Iodine must have been combined with Soda, in the state of Hydriodate, as no traces of Potassa could be detected. I do not think, from the faint evidences of it discovered, that a much greater quantity than half a grain could have existed in the gallon.