

separate the soluble lime-salt as carbonate, leaving to a subsequent stage the magnesian chlorid (§ 18.) As this reaction replaces the calcium-salt by chlorid of sodium, it might be expected that there would be an increase in the amount of the latter salt in the water wherever the magnesian chlorid predominates, did we not remember that evaporation separates it from the water in a solid form; and that the two processes, one of which replaces the chlorid of calcium by chlorid of sodium, while the other eliminates the latter salt from the solution, might have been going on simultaneously or alternately. As the nature of the waters now under consideration shows that the process of evaporation had been carried so far as to separate the sulphate in the form of gypsum, and probably also a portion of the chlorid of sodium in a solid state, it is evident that we have not yet the data necessary for determining the composition of the water of the Lower Silurian ocean, as regards the proportions of the sodium, calcium, and magnesium which it held in solution; and we can only conclude from these mother-liquors, that the amount of the earthy bases was relatively very large.

§ 39. As already remarked in § 22, the mother-liquor from modern sea-water contains no chlorid of calcium, but, on the contrary, large quantities of sulphate of magnesia; the lime in the modern ocean being less than one-half that required to combine with the sulphate present. If however we examine the numerous analyses of rock-salt and of brines from various saliferous formations, we shall find that chlorid of calcium is very frequently present in both of them; thus supporting the conclusions already announced in § 24 with regard to the composition of the seas of former geological periods. The oldest saliferous formation which has been hitherto investigated is the Onondaga Salt-group of the New York geologists, which belongs to the upper part of the Silurian series, and supplies the almost saturated brines of Syracuse and Salina in New York. These, notwithstanding their great purity, contain small proportions of chlorids of calcium and magnesium, as shown by the analyses of Beck, and the recent and careful examinations of Goessmann. In the brines of that region the solid matters are equal to from 14.3 to 16.7 per cent., and contain on an average, according to the latter chemist, 1.54 of sulphate of lime, 0.93 of chlorid of calcium, and 0.88 of chlorid of magnesium in 100.00; the remainder being chlorid of sodium.\*

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\* Goessmann. Report on the Brines of Onondaga: Syracuse, 1862 and 1864. Also Report on the Onondaga Salt Co.: Syracuse, 1862.