after a long period of time become appreciable in the ocean. The carbonic acid in the rain water must have acted, as it does now, on the silicates of sodium, potassium and calcium in the rocks and produced free silica and carbonates of these elements, these latter going into solution and thus reaching the ocean, where, acting on the chloride of calcium, carbonate of lime and chloride of sodium and potassium would be formed. The calcium carbonates would be removed by deposition and thus constitute the origin of the limestone beds of the pre-Cambrian age, but the chlorides remaining in solution, thus contributed to an increase in the amount of sodium and potassium in the sea water.*

The sulphates in the rock crust disintegrated or affected would also be carried to the sea, but, as these would be small in quantity, they need not be specially considered here.

Thus the history of the sea must have begun and continued for a period of unknown length. The only change came from the discharge into the sea of the carbonates, the consequent removal of the lime and the slow increase in amount of magnesium, sulphuric acid, and of potassium and sodium. The two latter elements were not removed from the sea except through the rainfall. As I shall presently point out, the potassium compounds are to-day removed from the ocean apparently as rapidly as they are added by river water, and, in consequence, the amount in sea water now appears to be stationary. In the earliest geological period the conditions which now contribute to this result did not exist, and the ocean retained all the potassium it held or received through river discharge. In all probability the potassium equalled, and even exceeded, the sodium in amount.† When sediments began to form, and, when soils made their appearance, then, and then only began the elimination of the potassium from the ocean. It has been long established that potassium manifests a marked capacity to unite with silicates of alumina to form firm compounds, and these obtain whenever potassium salts in solution come in contact with argillaceous material, sedimentary or otherwise,‡ while the sodium, magnesium, and calcium are unaffected.

* Sterry Hunt (Chemical and Geological Essays, Boston, 1875) held the view that the most abundant constituent in primeval sea water was calcium chloride, and that with the gradual addition of sodium carbonate calcium was removed as carbonate and sodium chloride consequently took its place.

† Joly (*loc. cit.*) assumes that the greater part of the chlorine now in the ocean was originally united with the iron, calcium, magnesium, potassium, and sodium, these elements entering into combination in proportion parallel to the proportions in the rock-crust as determined by F. W. Clarke (*loc. cit.*) This postulates that 14 per cent. of the chlorine now in the ocean was united with sodium, and consequently the ocean originally contained about one-seventh of the sodium it now holds. As the proportion of sodium to potassium in the rock crust is 100 to 95, on Joly's hypothesis the potassium in the primæval ocean must have really equalled in amount the sodium therein. Joly, however, is in error in supposing that the chlorides of magnesium and iron could have existed, and he should consequently have made a greater allowance for the amounts of chlorine combined with the sodium, potassium, and calcium.

‡ Sterry Hunt (*op. cit.* p. 95.)