

In tropical and temperate regions there is likewise a much greater accumulation of carbonate of lime remains on the bottom than at like depths towards the polar areas, where the surface waters have a low temperature throughout the year. At the present time, then, it is evident that there is a decided tendency for carbonate of lime deposits to accumulate towards the equatorial regions of the ocean. In the central parts of the equatorial regions of the ocean basins this carbonate of lime is almost exclusively derived from the shells and skeletons of pelagic organisms whose habitat is in the warm surface and subsurface waters. That these pelagic shells should be abundant on the bottom in tropical regions at nearly all moderate depths, and wholly or almost wholly absent from the deposits in all the greater depths, has been regarded as one of the most remarkable facts brought to light by the Challenger investigations. This fact, however, admits of a ready explanation, if it be remembered that all these shells are subject to solution immediately on the death of the organisms, that only a small number of them—the more delicate ones—are wholly removed in falling through a moderate depth of water, while a very large proportion are wholly dissolved in falling through a depth of four or five miles.

Mr. Murray made a large number of experiments during the expedition with the view of ascertaining the rate of fall of pelagic organisms in sea-water. The experiments were conducted in a long glass cylinder, and the rate was found to vary greatly according to the shape of the shell and the albuminoid matter associated with it. According to the results of these experiments it would take from three to six days for the shells to reach a depth of 2500 fathoms. In the deeper layers the rate of fall would probably be much slower than in the surface layers, owing to the shells being less compressible than water.¹ It has also been shown that solution of carbonate of lime shells takes place more rapidly under pressure.² In this dissolution of the carbonate of lime shells the reaction referred to on pages 255 and 256 appears to play an important role. Besides it must be remembered that in the greater depths of the ocean, those shells which may reach the bottom are not covered up so rapidly by other shells falling from the surface, as they undoubtedly are in the shallower depths, where large numbers reach the bottom, and there accumulate. The practically motionless water in contact with the large quantity of carbonate of lime in moderate depths would in addition soon become saturated, and consequently be unable to take up more carbonate of lime, for sea-water can only take up a relatively small quantity of carbonate of lime in addition to what it normally contains. The water in contact with the deeper deposits, in which there is but little carbonate of lime, would not become thus saturated. These considerations also explain why the whole of the carbonate of lime shells are removed from the deposits at lesser depths in extra-tropical regions, where there are fewer living calcareous organisms at the surface, than in the tropics beneath the warm oceanic currents, where the surface shells are much more abundant.³

¹ Murray and Irvine, *Proc. Roy. Soc. Edin.*, vol. xvii. p. 98.

² Reid, *Proc. Roy. Soc. Edin.*, vol. xv. pp. 151-157, 1888. ³ Murray and Irvine, *Proc. Roy. Soc. Edin.*, vol. xvii. p. 97.