of temperature, and may in some instances form a considerable layer of decomposing matter on the bottom of the ocean. It is also well known that large numbers of pelagic creatures are in like manner destroyed where there is a mixture of waters of different salinities, for instance, where polar and equatorial currents mingle, or where large quantities of fresh water are thrown into the ocean from floods in great rivers.[1] By taking account of phenomena such as these, which would result in the destruction of large numbers of pelagic animals at one time, thus covering the deposit in process of formation with a vast layer consisting of the dead bodies of marine animals, it is believed that the origin of the thin bands of phosphatic nodules, so frequent in geological formations, may be accounted for.

The phosphatic nodules observed in existing deposits belong then to the coast zone. They may be found in all terrigenous deposits, and also along the edge of the abyssal zone in deposits of a pelagic type, which, however, from their nearness to land, still contain terrigenous elements. The resemblance of these deposits to those of geological formations containing phosphorites in greatest abundance—the greensands, glauconitic chalks, and pure chalks—is so evident that it is unnecessary to insist on it. The mode of formation of the one must have been almost identical with that of the other, and the interpretation of the origin of the phosphatic concretions of existing seas should be equally applicable to those of the Cretaceous and Tertiary formations, for example.[2] Reference has already been made to the analogies between the phosphatic nodules of modern sediments and those of a great number of nodular phosphates of the chalk and greensand formations, so much so that it might even be asked whether the concretions described in this chapter might not be derived from ancient formations cropping out at the bottom of the sea. This doubt is at once removed when account is taken of the fact, already pointed out in treating of the microstructure of these concretions, that they contain, cemented and enclosed by phosphates, the remains of organisms and mineral particles identical with those constituting the actual sediments in which the concretions are found. These phosphatic concretions must therefore be regarded as having been formed *in situ*.

Mode of Formation.—If we ask whence the phosphate of lime found in these nodules is immediately derived, we may set aside in the first place the hypothesis of a direct derivation from the interior of the globe, for although it is evident that in certain cases a small percentage of phosphate of lime in deep-sea muds might be attributed to apatite coming from volcanic rocks, still even at the highest estimate the amount of phosphate of lime coming from this source must be very subordinate relative to that derived, for instance, from organic remains. Nor is there any reason in the conditions under which they have been formed for supposing that the phosphate of lime could have been derived from submarine springs. Again, we find nothing in the surroundings to induce us to

[1] Murray, *Scot. Geogr. Mag.*, vol. vi. pp. 481, 482, 1890.

[2] Murray, *loc. cit.*, pp. 464, 465.