

to the surface of the water. The starfish had been entangled in the line so little above the mud, that fragments of its arms, which had been broken off in the ascent of the line, were picked out from amongst the mud."<sup>1</sup>

In 1826 Henry Milne-Edwards and Audouin made zoological expeditions along the French coasts, afterwards continued on the Sicilian coasts with de Quatrefages; in 1828 the Russian Lütke explored the archipelago of the Caroline Islands, and from 1831 to 1836 the observations of Fitzroy and Darwin were conducted during the voyage of the "Beagle." These expeditions awakened much interest in marine zoology, and gave an impetus to many scientific questions connected with oceanography.

In 1836 Ehrenberg produced his first works. His name will ever remain inseparably connected with the discoveries relating to the microscopic organisms of the sea. It would be impossible to enumerate here the numerous memoirs and important publications of this micrographer, who devoted his whole life, with extraordinary activity, to the study of microscopic organisms, of atmospheric dust, of material brought up from deep soundings, and of numerous questions appertaining to the sea. One salient point may be dwelt on, viz., the connection he established between certain classes of living microscopic organisms and the part they played in geological times. As early as 1836 he showed that the siliceous strata known as "Tripoli," found in various parts of the globe, especially at Bilin in Bohemia, were but an accumulation of the skeletons of Diatoms, Sponges, and Radiolaria; he pointed out the presence of Diatoms in the subsoil of Berlin. In 1839 his observations at Cuxhaven revealed the presence of living Diatoms and Radiolarians on the surface of the Baltic, belonging to the same species as those found fossil in the Tertiary deposits of Sicily and Oran. He showed, moreover, that in the Diatom layers of Bilin the siliceous deposit had, under the influence of infiltrated water, been transformed into compact opaline masses. Starting from these facts, he concluded that rocks similar to those which play so important a part in the terrestrial crust are still being formed on the bottom of the sea by minute organisms. He recognised the association of greensand and Globigerina limestone. His observations exercised a great influence on the study of micro-organisms, whose rôle in nature is in an inverse ratio to their size.

The United States sent out their first purely scientific expedition in 1839 under the command of Captain Wilkes. This expedition returned in 1842; its work was chiefly geographical and astronomical, but during the first year a few dredgings were made in shallow water, and a number of deep soundings were obtained at intervals during the voyage. The sounding line employed was a copper wire, a great improvement on previous methods. The great American naturalist Dana, who accompanied this expedition, added much to our knowledge of several groups of shallow-water and pelagic animals, and the geology and mineralogy of many oceanic islands.

<sup>1</sup> See Carpenter, *Proc. Roy. Soc.*, vol. xvii. p. 177, 1868.