

decomposition like that of rotten wood, others held it to be a bituminous substance endowed with a self-shining power,<sup>1</sup> and others considered that it was produced in some unknown manner by living creatures.

The specialization of research in the modern sense was unknown to the philosophers of the seventeenth century, and when in the eighteenth the observational and experimental sciences began to separate out and develop, each in its own direction, marine research was, for a time, practically neglected. The chemist was busy investigating the riches of the earth and fighting over theories; the natural philosopher was studying light, heat, sound, electricity, and motion; the geologist was at work on the rocks and in the mines; the naturalist studied the terrestrial animals and plants of his own and distant countries, those living in the sea or on the seashore receiving less attention. The attention of navigators was fully taken up with the perfecting of their science, the development of nautical astronomy, the study of the forces which control the magnetic needle, the discovery of the longitude, the search for new lands and new routes.

Deep soundings in several parts of the ocean were recorded about the middle of the eighteenth century, but considerable caution must be used in discussing these, as the methods in use at that time were not such as to make any depth exceeding a few hundred fathoms a matter of certainty. In 1749 Ellis sounded in 891 fathoms off the northwest coast of Africa, and observed the temperature at that depth. Before the invention of the self-registering thermometer, the temperature below the surface was ascertained by taking a sample of water from the required depth in a bottle or valved box made of as imperfect heat-conductors as possible, and noting the temperature when brought on deck; this, at the best, was unsatisfactory.

In 1558 appeared the fourth book of Gesner's work on the History of Animals,<sup>2</sup> which is devoted to the nature of fishes and marine animals, and John Jonston,<sup>3</sup> who studied at St. Andrews in 1619, published in 1649 a treatise on aquatic animals, while other authors of less note contributed to the slowly increasing knowledge of littoral and pelagic animals and plants during the fifteenth, sixteenth, and seventeenth centuries.

The honour of first employing the dredge as a means of scientific investigation is claimed for two Italian naturalists—Marsili and Donati—who about 1750 used an ordinary oyster dredge for obtaining specimens in shallow water. In 1779 Otho F. Müller, a Danish zoologist, invented a special naturalists' dredge, a net attached to a square iron frame, and with this arrangement he studied the marine fauna of the coast of Denmark to a depth of 30 fathoms. The rich variety of form and colour, the enormous abundance of living creatures of all kinds, seemed like the revelation of a new world. It may be imagined how those old explorers felt who first caught sight of the wonders hidden by

<sup>1</sup> Encyclopédie Méthodique, art. Mer, t. ii. p. 744, 1786.

<sup>2</sup> Historiæ Animalium, Liber iv., Tiguri, 1558.

<sup>3</sup> Historiæ naturalis de Piscibus et Cætis Libri V.; de Exanguibus aquaticis Libri IV., Francf., 1649, Amst., 1657.