

The expedition of Edmund Halley, Astronomer-Royal, in 1699, to improve our knowledge concerning longitude and the variation of the compass, was a purely scientific voyage, though it may be said that scientific voyages were really initiated at the time of James Cook in the second half of the eighteenth century.

Halley's expedition.

Cruquius introduced bathymetrical contours on a chart of the River Merwede published in 1728. Thus contour lines were first used on maps to show the depths of the sea and not the heights of the land.

Bathymetrical contours laid down on maps. Cruquius.

In a map published by Philippe Buache in 1737 we find the bottom of the sea again represented by isobathic curves, intended to show that certain elevations of the sea-floor correspond to the orography of the neighbouring land. He develops these ideas in his *Essay on Physical Geography*, published in 1752, maintaining that the globe is sustained by chains of mountains crossing the sea as well as the land, forming as it were the framework of the globe—a view previously expressed by Father Athanasius Kircher. His conception of submarine mountains was a first step towards founding geography on the real form and relief of each region.

Buache.

Kircher.

The dredge seems to have been first used by two Italians, Marsigli and Donati, about the year 1750, for obtaining marine organisms from shallow water, and a modification of this form was introduced by O. F. Müller in 1799, which was known as the naturalist's dredge.

First use of dredge. Marsigli and Donati. O. F. Müller.

In the middle of the eighteenth century Dalrymple and Davy made observations on the temperature of the equatorial currents during a voyage to the East Indies.

Temperature observations. Dalrymple and Davy.

In 1770 Benjamin Franklin published the first map of the Gulf Stream (see figure in Chapter V.), and in 1776 Charles Blagden was engaged in the study of temperature distribution on the North American coasts, reporting on his results to the Royal Society of London in 1781.

Benjamin Franklin. Blagden.

During Cook's voyages (1772-73), temperature observations beneath the surface were taken by the Forsters, father and son, but the first use of self-registering thermometers for determining the temperature beneath the surface of the sea was during Lord Mulgraves' expedition to the Arctic in 1773 by Dr. Irvine, who seems also to have constructed a water-bottle for bringing up water-samples from various depths, one sample giving a reading of 40° Fahr., while the surface temperature was 55° Fahr.

James Cook. The Forsters.

Irvine.