

disclose two adjacent regions in which the bottom temperatures differed as much as 15° Fahr. (30° Fahr. in the one region and 45° Fahr. in the other), and it was concluded that great masses of water at different temperatures were moving about, each in its particular course, maintaining a remarkable system of oceanic circulation, and yet keeping so distinct from one another that one hour's sail might be sufficient to pass from the extreme of heat to the extreme of cold.

Peculiar temperature conditions in the Faroe Channel.

In 1869 Gwyn Jeffreys was associated with Carpenter and Wyville Thomson in carrying on the work on board H.M.S. "Porcupine," which made three cruises: (1) to the west of Ireland, where dredgings down to 1470 fathoms were taken; (2) to the Bay of Biscay, where dredgings were taken in depths exceeding 2000 fathoms; and (3) to the Faroe Channel to confirm and extend the "Lightning" observations. In 1870 the "Porcupine" carried on work in the Mediterranean and the Strait of Gibraltar, which was continued in 1871 on board H.M.S. "Shearwater."

H.M.S. "Porcupine." Jeffreys, Carpenter, and Thomson.

About the same time Leigh Smith made several voyages to the Arctic regions, and, like Scoresby, recorded warmer layers of water beneath the colder surface waters of the Arctic Ocean.¹

Leigh Smith.

The researches briefly noticed in the preceding paragraphs paved the way for the special investigation of the physical, chemical, and biological conditions of the great ocean basins of the world carried out on board H.M.S. "Challenger" from December 1872 to May 1876 by a staff of scientific observers. During this period she circumnavigated the world, traversed the great oceans in many directions, made observations in nearly all departments of the physical and biological sciences, and laid down the broad general foundations of the recent science of oceanography. The results of the "Challenger" Expedition were published by the British Government in fifty quarto volumes, and became the starting-point for all subsequent observations.

The "Challenger" Expedition.

Contemporaneous with the "Challenger" Expedition was that of the U.S.S. "Tuscarora," under Belknap, in the Pacific Ocean, which contributed greatly to our knowledge of the

The "Tuscarora." Belknap.

¹ Leigh Smith's temperature observations were published in *Proc. Roy. Soc. Lond.*, vol. xxi. pp. 94 and 97, 1873, and in *Natural Science*, vol. xi. p. 48, 1897. In the former paper Wells quotes a reading of 64° F. in 600 fathoms and a reading of 42° F. at 300 fathoms near Spitzbergen, and argues that they indicate the southward flow of a vast body of warm water from the circumpolar region, while in the latter paper Leigh Smith refers to a warm undercurrent running into the Arctic basin between Greenland and Spitzbergen.