

bations, and, in particular, of local storms with a vertical descending movement.¹⁹⁰

The distribution of temperature in lakes is a question of considerable geological interest, in regard to which careful measurements are much needed.

The observations of Sir Robert Christison, at Loch Lomond in Scotland, show that in this sheet of water, which lies 25 feet above sea-level, with a depth of about 600 feet, and is in great measure surrounded with high hills, a tolerably constant temperature of about 42° Fahr. is found to pervade the lowest 100 feet of water.¹⁹¹ More extended observations have since been made by Dr. John Murray and the staff of the Scottish Marine Station in Lochs Ness, Oich, Morar, and Shiel, as well as in some of the fjords and sounds of the west of Scotland, and the earlier observations have been confirmed. The surface of Loch Morar in September, 1887, was found to have a temperature of 57·8° Fahr., but at a depth of 160 fathoms the thermometer had fallen to 42·1°. The surface temperature of Loch Ness in the same month was 54°, but at 120 fathoms 42·1°.¹⁹² Again, in the Lake of Geneva the surface temperature in autumn is 78° Fahr., while the bottom water at a depth of 950 feet was found to mark 41° 7'. The Lago Sabatino near Rome has a temperature of 77° at the surface, but one of 44° at a depth of 490 feet. Similar observations on other deep lakes in Switzerland and Northern Italy indicate the existence in all of them of a permanent mass of cold water at the bottom. The cold heavy water of the surface in winter must sink down, and as the upper layers cannot be heated by the direct rays of the sun, save to a trifling and superficial extent, the temperature of the deep parts of these basins is kept permanently low.

¹⁹⁰ F. A. Forel, *Comptes Rend.* lxxx. 1875, p. 107, lxxxiii. 1876, p. 712, lxxxvi. 1878, p. 1500, lxxxix. 1879, p. 859; *Assoc. Française*, 1879, p. 493. P. du Bois, *Comptes Rend.* cxii. 1891, p. 122. For a valuable monograph on the regime of a typical lake, see Forel's "Le Léman," Lausanne, 1892.

¹⁹¹ For observations on the freezing of this and other lakes, see J. Y. Buchanan, *Nature*, xix. p. 412. On the deep-water temperature of lakes, A. Buchan, *Brit. Assoc.* 1872, Sects. p. 207.

¹⁹² *Proc. Roy. Soc. Edin.* xviii., 1890-91, p. 139.