

progress that has been made in the development of the Bird Research Laboratory at Gates Mills, Ohio, which he established.

The volume before us sets forth in detail various investigations upon the temperature of birds, especially of the House Wren, which was the subject of most of the experiments. Most of the results were obtained by the use of the thermocouple as explained previously in a paper in 'The Auk.'

There is considerable variability in the body temperature of Passerine birds due to muscular activity brought on by emotional excitement and other factors, and a regular daily rhythm rising until about noon and decreasing to midnight. Many other experiments are recorded relating to resistance to extreme temperatures etc., etc. Much information was also secured regarding the temperature of the nest, the eggs, and the incubating bird.

The work is illustrated by charts and photographs, and there is a bibliography and an excellent index. The handsomely printed volume will prove a valuable work of reference for those interested in the physiology of birds as well as physiology in general.—W. S.

Kendeigh and Shelford on Life Zones and Temperature Laws.—

The two papers¹ here reviewed appeared together in the 'Wilson Bulletin' and are evidently prepared in conjunction to question the accuracy of the data and methods employed by Merriam in outlining his theory of temperature control and his resulting life zones maps.

After considering data available in 1894 Dr. Merriam decided that animals and plants are restricted in northward distribution by the total quantity of heat during the season of growth and reproduction and in their southward distribution by the mean temperature of a brief period covering the hottest part of the year. As isotherms based upon these data corresponded fairly well to the boundaries of life zones based upon distribution of various birds and mammals, he assumed that they were the controlling factors in the north and south distribution of animals and plants.

Mr. Kendeigh, largely on the basis of experiments carried on in the Baldwin Bird Research Laboratory, claims as objections to Merriam's first law that temperatures at other times of year than the season of reproduction may be effective in limiting northward range and that the mere agreement of isotherms with the boundaries of life zones does not prove that the former are the critical factors in limiting distribution without an adequate physiological basis. He also considers that the basis of "summing temperatures" used by Merriam is without significance because the temperature threshold of development varies widely in different species and because there is a marked difference in the rate of development at different temperatures. Moreover, the actual data used by Merriam (as later admitted) was, by an oversight, incorrectly determined. Some of the same

¹ A Study of Merriam's Temperature Laws. By S. Charles Kendeigh, *Wilson Bulletin* Sept. 1932, pp. 129-143 and *Life Zones, Modern Ecology and the Failure of Temperature Summing*. By V. E. Shelford. *Ibid.*, pp. 144-157.

arguments are advanced against Merriam's second law while it is claimed that daily maximum temperatures are more important than daily mean temperatures in controlling southerly distribution of birds.

While Mr. Kendeigh concerns himself with the actual influence of temperature, as the result of experiments, Dr. Shelford attacks the whole question of life zones based on temperature.¹ He quotes Dice, Pilsbry and others who consider that Merriam's life zones emphasize secondary and not primary facts of distribution. While he admits that in the mountainous regions, especially of California, there is considerable agreement between plant-animal communities and life zones, he claims that there is little in common between the fauna and flora of the eastern, middle, and western sections of the transcontinental zones as drawn by Merriam. "The two systems [faunas and zones]" he writes, "are so completely out of harmony as to viewpoint that it is best to leave the life zones to the field of zoogeography, having for its aim the explanation of evolutionary phenomena, but with no ideas of modern community analysis or experimental work. The American life zone viewpoint has been carried so far in the United States Biological Survey that it has faced modern problems of biotic balance, relation to weather and other relations of agriculture and grazing without suitable scientific foundation."

Dr. Shelford's claims, as shown by his quotations are by no means new and as he points out there are two quite different viewpoints involved, the "zoogeographic" and the "ecologic." There is much more in ecologic areas than some would admit, doubtless due to the criticism that ecologic extremists (or incompetents) have brought upon the subject by their ridiculous contributions, and for practical purposes "life areas" based on other factors as well as temperature will prove more satisfactory and logical. The presence of two quite different viewpoints in this problem as well as in discussing the origin of faunas must, however, be kept clearly in mind—one dealing with present day distribution and the other with the past.

While Dr. Shelford's bibliography includes many important contributions to the subject some of the most important are omitted, notably Dr. J. A. Allen's on life zones and distribution of North American mammals and birds published forty years ago (*Bull. Amer. Mus. Nat. Hist.*, LV, pp. 199-244, 1892; and *Auk*, April, 1893) where the same ideas that are advanced by Dr. Shelford as to the distinction of "faunas" and "zones" are in great measure set forth. The subject is always an attractive one for discussion and we welcome any presentation of constructive data.—W. S.

Lowe's 'Trail that is Always New.'—This well written book with its title from Kipling¹ will be read with much interest by those who have studied the more technical literature based upon the collections made by

¹ The Trail that is Always New | By | Willoughby P. Lowe, M.B.O.U., F.Z.S. | Collector for the British Museum (Natural History) | Illustrated by | H. Grönvold and J. P. W. Lowe | Gurney and Jackson, London, 33 Paternoster Row, E. C. Edinburgh; Tweedale Court 1932. Pp. i-xviii + 1-271. Price 16 shillings net.