

and on its intestinal flora, are all treated. Finally, to every section or subdivision of a section a description of the physical, chemical, and biological methods of investigation is appended.

That we have much yet to learn concerning many of the natural processes involved is apparent from a perusal of such a section as that on the heating and firing of hay. This appears to take place in three stages, a first in which the temperature rises to 45-50° C., a second in which the temperature rises from 50° C. to 70° C., and a third which proceeds above 70° C. The first two stages are caused by the activities of micro-organisms involving processes of decomposition and oxidation ("thermophilic" bacteria being active between 50° and 70° C.), but the cause in the third stage of the production of heat above 70° C. and ultimately culminating in ignition is not so obvious. It is probably a physico-chemical process due to the production of carbonaceous and other matters which adsorb, condense, and oxidise the hydrogen, marsh and other inflammable gases, which have resulted from decomposition in the earlier stages, and cause their ignition, much in the same way as spongy platinum causes the ignition of hydrogen.

Nor is the subject-matter strictly confined to "bacteriological" details, but if others are of importance in relation to the general treatment of a subject, they are included. Thus, as regards milk, not only is the importance of streptococci discussed, but the nature and significance of the cellular elements which are constantly present in less or greater number are reviewed. These cellular elements when in small numbers have generally been considered to be leucocytes, when in large numbers as pus cells and to be abnormal, but investigation has shown that under normal conditions and with perfectly healthy cows these cells are occasionally present in enormous numbers; all this is summarised.

Considerable space is also devoted to the chemistry of the changes and decompositions which occur in the various processes, and while the vegetable micro-organisms claim most attention, some reference is made to the protozoa and higher animal organisms, e.g. earth-worms and their importance. Had the work been compiled later, doubtless more space would have been devoted to the protozoa, the treatment of which as it stands is too brief.

The book, which is not illustrated, is clearly printed on good paper with numbered lines for facility of reference, and concludes with very full and complete indexes of authors and subjects.

(2) This little book, by the same author as the preceding, gives in the briefest outline a general account of bacteriological methods followed by a series of simple practical lessons on the bacteriology and biochemistry of milk, manure, and soil. The student who works through these lessons will certainly gain a considerable amount of knowledge of the subjects treated, and will be ready to undertake more advanced work. Many illustrations are given, most of which are good and appropriate, though the methods of inoculating tubes given in Figs. 19 and 24 seem clumsy and archaic.

R. T. H.

#### OUR BOOK SHELF.

*British Rainfall, 1910. On the Distribution of Rain in Space and Time over the British Isles during the Year 1910, as recorded by nearly 5000 Observers in Great Britain and Ireland, and discussed with Articles upon Various Branches of Rainfall Work.* By Dr. H. R. Mill. The fiftieth annual volume. Pp. 112+328. (London: Edward Stanford, 1911.) Price 10s.

THE author remarks in his report to the trustees that the chief object of the rainfall organisation is to present the results of the labours of the observers in the best and most useful way. An inspection of the volume under review leaves no doubt that this desirable aim has been fully attained. As in former years, the work is divided into three principal sections, including, *inter alia*, (1) organisation and special articles, (2) monthly and seasonal rainfall and its relation to the average and heavy falls of rain (see NATURE, February 2), and (3) general table of annual rainfall and number of rain-days at 4874 stations. The cartographic treatment has been carried further than in previous volumes; the maps referring to heavy falls on rainfall days are of exceptional interest, and include a series of remarkable thunderstorms which occurred chiefly in the south of England from June 5 to 10, with a coloured map (as frontispiece) showing the distribution of torrential rains in the Thames valley on June 9.

The most laborious of the changes this year is the more satisfactory arrangement of the stations of the general table for England and Wales in river basins, although for convenience of reference the counties are retained as the units. This forms the subject of a special article, illustrated by maps of each division showing the county boundaries and watershed lines. The treatment of the stations in Scotland and Ireland has been postponed. Another laborious piece of work has been the introduction of a new rainfall average based on the thirty-five years 1875-1909. For the British Isles generally and for Ireland this makes practically no change, so far as the annual totals are concerned, from the thirty years' average. For England the new average is 5 per cent. less, in Wales 3 per cent. less, and in Scotland 4 per cent. more.

In a special article on the greatest rainfall which may occur on the wettest day of the year it is shown that during the last forty-seven years falls of 4 inches have occurred in a great number of counties, even exceeding 6 inches in a few. Another useful article on the rain-gauge in theory and practice will remove several of the difficulties usually experienced by beginners of rainfall observations. We cannot conclude this notice without expressing regret that this very valuable organisation is not self-supporting, and that a considerable financial burden has to be borne by the director.

*Partridges and Partridge Manors.* By Captain A. Maxwell. Pp. xii+327. (London: A. and C. Black, 1911.) Price 7s. 6d. net.

WHAT the author accomplished with the assistance of Mr. George Malcolm in 1910 for the grouse he has succeeded in doing single-handed for the partridge in 1911, and the praise we felt bound to accord to his former effort we have pleasure in re-echoing in the case of the present beautifully illustrated volume. It contains, in fact, practically all that the sportsman ought to know with regard to the plump brown game-bird of our stubbles, and much that ought to interest the ornithologist. For Captain Maxwell appears to be a good field observer himself, and has likewise availed himself largely of the stores of information