

areas, etc. On that score alone it is important to create these nature reserves without undue delay. Once they are established, they can scarcely fail to promote the formation of a public opinion which really understands what is involved, and which will both bring about a new attitude to the use of land and of the national parks and also be prompt to rally to the defence of amenity behind those bodies which, like the National Trust and the Council for the Preservation of Rural England, have done such sterling work in the past.

GRASSLAND: MODERN SCIENCE AND PRACTICE

Grassland and Grassland Products

By Prof. Stephen J. Watson. Pp. vii+200. (London: Edward Arnold and Co., 1951.) 21s. net.

IT is fortunate that Prof. S. J. Watson was appointed as Clive Behrens lecturer in the University of Leeds for the sessions 1948-49 and 1949-50, for otherwise it is likely that we should have to have waited some time for this masterly review of what has rapidly become a vast subject and one which goes to the core of modern agricultural practice in Great Britain.

Almost at the outset (p. 13) the reader is left in no uncertainty as to the guiding principle which must lie behind all grassland research and which must dominate practice. This principle is the more tellingly formulated since it is stated in the words of a man—Dr. David Wilson (later Sir David Wilson, Bart.)—who had obtained his evidence as long ago as 1885-88: “compared with the difference of composition at different stages of growth, the differences between the composition of the various grasses cut at the same stage are small”. The mass of recent evidence which completely supports this dictum is fully discussed, and the influence of leafiness and rapidity of leaf growth on digestible crude protein is emphasized. It is not so generally realized “that the younger and leafier the plants the greater their content of the major mineral constituents such as calcium, phosphorus and potassium”. The trace elements, on the other hand, Watson says, will be related entirely to the soil analysis; it is perhaps, however, premature to imply that a specific influence may not here exert itself. Speaking generally, “the younger the plants the greater will be their value as a source of vitamins”.

In the chapters on the growing and management of grassland herbage, the salient points are made abundantly clear. Thus the losses from an acre of good grassland frequently cut for drying “may equal 7 to 8 cwt. of Sulphate of Ammonia, 3 cwt. of Superphosphate and 4 cwt. of Muriate of Potash”. Very properly, a considerable amount of space is devoted to permanent grass, and the author does well to quote examples of practices adopted more than fifty years ago with the view of evening out and extending the grazing season—“early bite” is not a new conception. Modern methods of rotational grazings are fully discussed. In so far as ley farming is concerned, a little more might have been said as to the possibilities; and, although beyond the scope of the author's treatment, readers should be reminded that the most important feature of that system is that it

adds to the arable acreage and that in a well-balanced rotation the ley sod is an invaluable aid to maintaining the structure and humus content of the soil.

The chapters on the conservation of grass are models of accurate and terse statement. A telling summary of the losses in nutrients that occur in the different conservation processes is given in Table 53. The factors respectively influencing the carotene and protein content of dried grass are fully explained. “The carotene content of dried grass is always falling.” It is influenced by the methods adopted on the field, in the dryer and by “time and method of storage”. The carotene content “can be no guide to stage of growth or protein content”. After a full review, Prof. Watson states that “at the present juncture it is certain that ensilage is the process on which chief emphasis should be laid if we are to utilize grassland to its fullest extent”.

The wealth of information packed into these two hundred pages is admirably arranged, the statements of fact are always concise, and at all stages the practical implications are simply and clearly brought out. The book will be of equal value and equally intelligible to the specialist, the student and to the up-to-date farmer. A valuable feature of the book is the excellence of the fifty-three tables, which have the merit of being readily understandable without repeated reference to the text. These are supported by twenty-two well-arranged graphs and diagrams and by thirty-one adequate illustrations. References to the extensive literature quoted are given at the end of each chapter. The index is in keeping with the high standard of the book and very properly is in two parts, author and subject.

R. GEORGE STAPLEDON

THE LOGIC OF ADAPTATION

Analytical Biology

By G. Sommerhoff. Pp. viii+208. (London: Oxford University Press, 1950.) 17s. 6d. net.

THIS book is a valuable addition to the comparatively small literature which deals with the logical analysis of biological notions. The author is bold enough to tackle the problem of “biological purposiveness”, which has often been taken to justify the belief that theoretical biology must operate with categories which cannot be stated in the conventional terms of the physical sciences. He argues that all cases of apparent purposiveness can be regarded as instances of adaptation; and, of the latter concept, he proceeds to offer an attempt at a precise description. His definition is one which can most easily be envisaged in terms of a self-regulating mechanism such as an automatic gunshot.

The basic phenomenon of adaptation is given the name of “directive correlation”, and the elements involved in its definition are four in number; the “œnetic variable”, which is a prior condition having a causal influence on both the environmental situation which is adapted to, and the response which adapts, these two being jointly affected in such a way that they issue in the goal (or “focal condition”) of the adaptation. The logical relations involved in such a notion are discussed both in normal language and in more precise mathematical terms, and the author then proceeds to some applications of the idea of directive correlation to general biological problems. It is, of course, true that such an idea is in no sense