has proved the three primes theorem without this assumption.)

Each group of problems in the *Collected Papers* has a lucid introduction and commentaries on subsequent developments and unsolved problems. The papers themselves make absorbing reading—I am ashamed to admit that I was reading many of them for the first time—and reflect the extremes of creativity and technical facility which were characteristic of the authors. One is impressed, too, by the elegance of the style. It is not inappropriate to compare it with accounts given in Wisden of the cricket of the day; both present us with glimpses of a more generous age.

J. V. ARMITAGE

THE THYMUS

The Thymus

Experimental and Clinical Studies. Edited by G. E. W. Wolstenholme and Ruth Porter. (Ciba Foundation Symposium.) Pp. xiii + 538. (London: J. and A. Churchill, Ltd., 1966.) 80s.

THE true nature of thymic function has always been one of the most intriguing mysteries in biology. Suggested roles have ranged from the filling of the thorax during contraction of the lung to the elaboration of a fluid to attenuate the blood, and apart from one or two notable contributions to our knowledge during the first fifty years of this century, there has been very little evidence on which to base better theories. The deficiencies are now being made good and a wealth of information has been collected, particularly in the past few years.

In this volume are some twenty contributions covering a fairly wide range of processes in which the thymus appears to play a leading part. The papers were read at the meeting arranged in Melbourne in August 1965, in honour of Sir Macfarlane Burnet on his retirement as director of the Walter and Eliza Hall Institute of Medical Research. Fittingly, all the contributions are of a high standard, and from them and the discussions which follow a very comprehensive survey emerges of what is known about the gland and of the present trends of thought preoccupying those who are actively engaged in research.

During the past few years, following the work of J. F. A. P. Miller, attention has been focused mainly on the role of the thymus in immunity and on the associated—indeed inseparable—problem of the origin, function and fate of the lymphocyte. Miller's own contribution to the symposium emphasizes the central part which the thymus plays in the development of immunological capacity and suggests that the chief functions may be the provision of lymphocytes or precursor cells and the elaboration of a factor which induces competence. Supporting evidence for thymic hormone production is provided by the electron microscope studies of S. L. Clark, but D. Metcalf provides convincing evidence against any massive migration of thymic lymphocytes to peripheral lymphoid tissues as was previously thought to occur. Elegant experiments by J. L. Gowans and his co-workers demonstrate the close association between antibody production by lymphocytes and the mode of presentation of the antigen. The macrophage may be an essential intermediary in the inductive process. An important theme which emerges from this and from other work, including that of Auerbach on embryogenesis of thymus and lymphocytes, is the possibility of the existence of two functionally and developmentally separate systems of cells, one responsible for antibody formation and the other for the mediation of transplantation reactions. As yet, the only direct experimental evidence for the existence of two such systems derives from work on the bursa of Fabricius of chickens. There have been reports, however, post-dating the Melbourne meeting, of the ability of neonatally thymectomized animals to produce antibody

to certain antigens, and in this volume Professor Good directs attention to the same kind of dissociation found in man.

Other contributions deal with the relationship between the thymus and tolerance, the competence of cloned cell populations and with the thymus in ontogeny and phylogeny. Sir Macfarlane Burnet describes some of his own observations on mast cell metaplasia in the thymus, and some of the work done on the relationship of the gland to the auto-immune haemolytic disease of the NZB strain of mice is also presented.

With the increasing awareness of the importance of the thymus in immunobiology, there has been a re-awakening of interest in the pathology of the human thymus and in the association between it and immunological deficiency syndromes and auto-immune disease. These topics are dealt with in a number of interesting papers. The lecture given by Dameshek is particularly stimulating.

In any symposium, as in any single paper, only a few aspects of a topic can be touched on. It is out of the question, therefore, to lament the absence of reports dealing with the other myriad facets of thymic function. In any event, the recorded discussions between members of the symposium cover such a wide field that almost all the related problems are included. Indeed, the sections devoted to discussions form the most valuable part of the whole volume. It remains true, however, that although better theories of thymic function have now been formulated, they still do not fit all the known facts. It is to be hoped that the next few years will see further dramatic advances in our knowledge, and perhaps the answer to the problems of human auto-immune disease.

R. MAWDSLEY

THE FUNGUS SPORE

The Fungus Spore

Edited by M. F. Madelin. (Proceedings of the 18th Symposium of the Colston Research Society, held in the University of Bristol, March 28–April 1, 1966.) Pp. xvi + 338. (London: Butterworth and Co. (Publishers), Ltd., 1966.) 120s.

THE spore represents in some respects the most significant part of the life cycle of a fungus, and as such is of interest to all mycologists. This volume, therefore, in bringing together up-to-date information on many facets of spore behaviour, is a welcome addition to the mycological literature.

It comprises a series of authoritative papers from a symposium held at the University of Bristol, and the organizers are to be congratulated on the balance that has been attained between the diverse aspects of the main subject. The initial stages of the meeting were concerned with the process of spore production as observed in the main systematic groups. This topic, together with the associated one of spore structure, was enlivened by the prominence given to studies pursued with the aid of the electron microscope. A stimulating account of spore liberation by Professor C. T. Ingold introduced that part of the symposium devoted to spore dispersal and germination, and the latter aspect in particular received excellent coverage. Professor L. E. Hawker describes the "morphological and anatomical changes" that can be observed during germination, while Professors V. W. Cochrane and D. Gottlieb elucidate so far as is possible the associated biochemical metabolism. Some of the factors influencing spore germination were also discussed at some length, although perhaps a more ecological bias to this interesting subject would have been more rewarding. The concluding papers considered the part played by spores in the epidemiology of plant and animal diseases.

The compilation of these papers has, therefore, the essential ingredients of a first class reference book—