REVIEWS

METHODS OF PLANT BREEDING. 2nd Ed. H. K. Hayes, F. R. Immer and D. C. Smith, London : McGraw-Hill. 1955. Pp. 551+ix. 64s.

This is the second edition of Hayes and Immer's *Methods of Plant Breeding* first published in the United States some fourteen years ago. The revision, made necessary by advancing knowledge, has been undertaken by Dr Hayes in conjunction with Dr Smith whose name is therefore now added to the list of authors. Even though it is over ten years since he died, Dr Immer's name is retained, as a tribute to the value of the contribution he made when the book was first written.

The second edition shows a material expansion over the first, though the changes are by no means all simple additions. Rearrangements and even some deletions have also occurred. Among the additions are new chapters on heterosis, cotton and sorghum breeding, forage crops, and heritability. Sugar-cane breeding has been introduced and breeding for resistance to insect damage has been given fuller treatment. At the same time certain earlier chapters on the cereals have been combined into one. The extensive and useful account of statistical methods and field test design has been completely rearranged and to some extent amplified, though the description of lattice designs for testing large numbers of varieties has been perhaps a little surprisingly omitted.

These various alterations, however, have left unaffected the essential nature of the book as a compendium of information on plants and especially methods for the student of plant-breeding. As such it must be judged successful. No student who reads it at all conscientiously can fail to acquire a sound working knowledge of the problems facing the breeder and the methods for coping with them in our chief agricultural crop plants. He can turn back too and refresh his memory of the breeding techniques from the detailed schedules and diagrams in which the different operations are set out in various parts of the book. He can quickly look up the ways of carrying out at least most of the statistical operations which face him and he will find a most useful set of statistical tables collected at the end of the text. There is also a somewhat limited glossary of terms and an extensive collection of references, mainly American, for further and more specialised reading.

The early chapters set out to give an account of the role and of the genetical basis of plant-breeding, but they are disappointingly disjointed in both coverage and treatment. Nor are they always as up-to-date in the information they provide as one might reasonably expect. No doubt the student should already have a basic knowledge of genetics on which to build when he turns to plant-breeding, but a more systematic development of genetical principles as they apply to the work of the breeder would surely have been worth while. It is also disappointing to find no account in the chapter on seed production of the information which has come available, particularly during the past decade, about the factors determining pollen contamination and hence isolation requirements during the multiplication of seed. Neither the plant-breeder's task not the application of genetical principles stops short when the first seed of a new variety is produced.

These considerations should not, however, blind us to the book's virtues. Within its own limits it meets a real need and it will continue to be used both widely and profitably by students, and, we may venture to think, sometimes by more mature plant breeders also. The new edition is well produced and indeed comparison in this respect with its predecessor shows how far we have come from wartime and post-war shortages. We can also see how far we have moved in another respect, for the price in Great Britain has more than doubled. KENNETH MATHER.

FACTS OF LIFE. By C. D. Darlington. Allen and Unwin. Pp. 467. 40s.

Excuse for the appearance of a further review of Professor Darlington's book so long after publication may be found in the magnitude of the task, and in the importance of assessing its message.

The first two sections of the book are directed to setting out modern knowledge of reproduction and heredity by the historical method. The development of accurate notions of heredity has been a difficult matter as compared with the ease with which the physical sciences have progressed. Both the means of investigation and the logic of experimentation and inference had to reach a somewhat sophisticated level before decisive results could be got. But there is another reason, in some ways more serious (especially in that it still has implications for the present day). Darlington finds this in what may broadly be called " superstition " or a confusion between biology and morals. The facts of conception, birth and inheritance touch us all both more deeply and also more familiarly than, say, do the Gas Laws. One result is that vulgar ideas are hard to dislodge " Everybody already knows too much about it ". Another result is that all these topics are emotionally charged and a Freudian " resistance " makes us hold to preconceptions, which are often misconceptions. This happens in part by taboo ; in part because we are reluctant to follow out ideas to the point where we might need to question the relevant laws of Church or State : our own personal interpretation (sustaining our morale in daily life) of our relationship as individuals to the rest of Society is often based on suppositions which concern genetics.

Darlington's history of genetics thus has several themes. It disentangles the interactions between prejudice and discovery. It is an essay in scientific method and also in the sociology of science. And it analyses the philosophic bases of the notions of the great theorists.

We now reach modern genetics, with material genes and chromosomes, and a materialist theory of life and inheritance. The author now considers the general consequences of this theory.

In the first place, it should be noticed that Darlington renders a service to epistemology by his analysis of the notions involved in " indeterminacy ". Instead of this hackneyed and multivalent word, he uses " uncertainty " as descriptive of the random element in biological processes. This random element no more derives from a lack of causality than do the roulette wheels at Monte Carlo. It is a determinate consequence of understood mechanisms.

On this basis the mechanism of heredity though material is not simply determinate. Assortment and recombination imply a large scale uncertainty in inheritance. This uncertainty provides variation. Selection operates on variation. " Evolution does not arise from a property of progress or