

A large number of apparently simple experiments fail because some small detail has been neglected, and although some lecturers make a point of suggesting possible causes of failure and even think this has an educational value, they rarely hit on the real cause, and a succession of 'damp squibs' leads the student to doubt the validity of the statement that chemistry is an exact science. Lecture experiments should succeed if they are to fulfil their purpose. The causes of such failures are frequently stated in the book.

The ground covered is so wide that a detailed account of the book cannot be given. It may be said, however, that the inorganic chemistry section is well covered, although some excellent experiments are missing from it. The section on organic chemistry is brief and will require supple-

menting in a detailed course. The experiments on physical chemistry are particularly noteworthy, and there are many new demonstrations in this field. The physical properties of gases, solutions and colloids, energy and chemical change (including some good experiments on photo-chemistry), radioactivity, the ionic theory, electrochemistry and colloid chemistry are dealt with.

The author claims six major features for his book: wide scope, references to literature, accessibility, the selection of easily visible experiments which may be completed in a lecture period, suggestions as to the principles illustrated by each experiment, and adaptability to standard textbooks. These claims are justified, and everyone who has to perform lecture experiments in chemistry will find the book useful and helpful.

THE SCIENCE OF ANIMAL BREEDING

Animal Breeding

By Prof. Laurence M. Winters. Third edition. Pp. viii + 316. (New York: John Wiley and Sons, Inc.; London: Chapman and Hall, Ltd., 1940.) 21s. net.

ANIMAL breeding, says Prof. Winters, is the art of improving animals. As such, it depends for success on a skill of hand and eye which can scarcely be acquired from books, and indeed, in this third edition of his book, Prof. Winters is not so much concerned with the art as with giving students an up-to-date account of the science. His pages offer the younger generation of breeders and extension workers the gift of science to animal breeding—the organized knowledge which enlarges the scope and power of the enterprising craftsman. That the author now addresses himself to students involves an interesting transition, since the progressive breeder for whom the first edition was written has been deserted for the student whose background of fundamental sciences renders many modern investigations more intelligible.

Beginning with historical glimpses of the development of domestic animals, the book continues with the anatomy of the genitalia, the physiology of the breeding-cycle, the cytology of the gonads, and the technique of artificial insemination. Following this selection of applied sciences and at greater length is an exposition of inheritance which follows orthodox lines. Mendel's laws are explained and illustrated with some well-known simple examples, and then the more complicated genetic situations presented by selection and breeding for economic characters are considered. The choice of the most significant items from an

enormous mass of literature is difficult, and it is scarcely to be expected that any two authors would agree on the way to do it. Experienced readers may therefore think that some subjects in which they are interested, such as adaptation to environment, the creation of new breeds, or progeny testing, have received too little attention for a text-book, and that others, such as selection and breeding systems, have not been considered sufficiently from the point of view of the breeder whose difficulties will ultimately have to be met by the student. The author's wide range of experimental studies with their practical background well qualifies him as a guide for students, so that it seems a pity he has not dealt more fully with improvement as the breeder sees it.

To enunciate a number of good scientific reasons for following a certain line of action is one thing; to decide which of the multifarious and often conflicting considerations that arise in practice should receive greatest weight is quite another; and ignorance of the latter often breeds distrust of the former. Another feature that might be criticized is the use of illustrations from the 1924 edition, for example, Figs. 69 and 117, which are rather poor by 1940 standards. Whatever may be said of the details of his treatment, no one can complain that Prof. Winters is satisfied with the present rate of improvement in livestock. He wants shows to be occasions for instruction rather than carnivals; record of performance tests made and used; artificial insemination, cross-breeding and heterosis exploited. In short, he wants progress to be hastened by all available methods, a desire which all his readers will share.

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