REVIEWS

HEREDITY. An Introduction to Genetics. By A. M. Winchester. Harrap, London. 1964. Pp. 269. 18s.

There is a need for an inexpensive textbook on genetics as more universities teach basic biology to first-year students. This book covers the topics that are commonly taught in elementary courses with chapters on the physical basis of heredity, mono- and di-hybrid inheritance, multiple alleles and genes, linkage, gene structure, action and mutation and a chapter on heredity and environment. There are also chapters on sex-determination and sex-linkage, blood groups, chromosome aberrations and radiation hazards in an atomic age.

Unfortunately, the treatment of these topics conveys the impression that genetics is a descriptive science alone. There is little attempt, for example, to relate the segregation of genes in mono- and di-hybrid crosses with that of the chromosomes at meiosis. The cytological photographs are poor and some of the terminology is archaic such as the use of the terms dyad and tetrad for bivalent and the products of first meiotic anaphase respectively. The chapter on statistical methods treats the analysis of experimental data recipé fashion without any appeal to the common sense of what is being attempted. The figure appearing on page 106 is not that illustrating the inheritance of barred features in Plymouth Rock chickens. In short, though this book is right in size, coverage and price for use in basic biology courses, and by laymen, its content is not. Finally, for connoisseurs of prudery there is a collectors item on page 177 where an illustration of Klinefelter's Syndrome is shown with masked genitalia.

M. J. LAWRENCE.

DIAGNOSIS AND GENETICS OF DEFECTIVE COLOUR VISION. H. Kalmus. Pergamon Press, London. 1965. Pp. x+114. Price 50s.

Dr Kalmus has written an interesting book on the detection, classification and inheritance of colour vision defects. In the opening chapter he mentions the history of the discovery of colour-blindness in its various forms. He proceeds in the next chapter to an account of the trichromatic theory, not mentioning the four-colour theory in any way except in so far as it may apply to certain aspects of colour vision and colour-blindness which are due to factors not at the receptor level.

In the chapter dealing with types of defect Dr Kalmus appears to accept three degrees of protan defect, namely protanopia, extreme protanomaly and protanomaly, and three of deutan defect, namely deuteranopia, extreme deuteranomaly and deuteranomaly. He considers, however, that more than three abnormal alleles exist in each case, which result in a larger number of different defects. This is a little vague, and could have been made more precise by reference to actual data. For instance, it is true that there are various degrees of protanomaly and deuteranomaly in terms of deviation in the Rayleigh equation, as well as in magnitude of matching range, and

that the same applies even more to extreme protanomaly and extreme deuteranomaly. Some so-called extreme anomalous are little short of being dichromats, while others have wide matching ranges with little or no deviation of mid-point, while the degree of shortening of the red end of the spectrum is considerably variable among the extreme protanomalous, and some simple protanomalous subjects have little or no shortening of the red. All these points have been set forth exactly by other workers, and could have been mentioned, while on the whole pedigrees tend to show that these varieties appear to be inherited true to type. How far these differences are due to differences in the genes themselves; how far differences from trueness to type are due to hereditary differences in physiological medium in different individuals; or how far to congenital environmental and developmental differences not of an hereditary kind, we have no clear idea. A precise study of the extent to which various degrees and types of defective colour vision appear to be inherited true to type and how much and under what conditions, if any, they vary, would be a major research.

Dr Kalmus has included some useful notes on rod and cone achromats (or monochromats) night blindness, and tritan defects. He gives possible combination frequencies for red-green defective genes calculated for females on the one and two locus theories, and almost seems to luxuriate in doubt about the two locus theory. His discussion of male protan-deutan combinations is valuable. He proposes a useful system of gene symbols, different from that of Walls and Mathews (1952) or the reviewer (1951).

Chapters VI and VII, which are concerned with tests for the detection and classification types of defective colour vision by tests, will be interesting to all workers engaged in research and the practical problems of colour vision defect in relation to signal lights and industry. Dr Kalmus mentions verbal tests, description of the spectrum, lantern tests, observation of Maxwell's spot and speudo-isochromatic tests. He also discusses the 100-Hue and Dichotomous tests of Farnsworth, and anomaloscopes of various types.

It is unsatisfactory to base the anomaloscope technique on letting the subject manipulate the controls and making settings of the red-green mixture to match in colour various brightnesses of the yellow taken at random. A systematic psycho-physical technique is essential. Such a technique has been described by the reviewer and others very fully, and many data on its application published. The essential measurements to be made are of the end-points of the matching range when the yellow is equated with the red-green mixture in brightness before any claim of a colour difference is entertained. Then the position and magnitude of the matching range is known, and the mid-matching point is the middle point of that range. For dichromats the matching range extends to the limits of the scale and the concept of mid-point is arbitrary for them. It is not surprising that the anomaloscope is regarded as often unsatisfactory by testers who use randomly chosen matches made by the subject, rather than data established by a systematic pscyho-physical technique.

The examination of the hypothetical pathology of colour-blindness is interesting, and all the problems of the genetics of sex-linked defects, for which there are two loci and several allelic genes at each locus, are thoroughly dealt with. The book contains valuable sections on linkage, mapping the X-chromosome, isochromosomes and chromosomal peculiarities in relation to defective colour vision.

The final chapter is about defective colour vision in different human groups and the possible influence in the relaxation of natural selection against it due to increasing civilisation, the colour-blindness of the majority of mammals, pigmentation and colour vision, colour-blindness in relation to art and industry, and language and colour naming.

Although Dr Kalmus sometimes seems almost perversely disinclined to mention other people's work, even when it would support his claims, this is certainly a valuable book, and the Bibliography is good.

R. W. PICKFORD.

THE FOUNDATIONS OF HEREDITY

MICROBIAL AND MOLECULAR GENETICS. J. S. R. Fincham. The English University Press, London, 1965. Pp. 149+x. 15s.

The Modern Biology series to which this book belongs is intended for biology students in sixth forms and the first years at university. This volume sets out to describe the important advances of microbial and molecular genetics and the experimental evidence on which these are based. Furthermore it endeavours to present this material in a fashion comprehensible to those without prior knowledge of biology. The first objective is certainly achieved. All the main aspects of molecular genetics are adequately covered in a condensed but lucid fashion. However, much of this material is very advanced. The newcomer to biology will certainly gain something from this book, but considerable knowledge of biology and biochemistry is necessary for its full appreciation.

A brief introductory chapter is concerned with the basic biology of the genetic systems of a number of organisms which have been particularly used in genetical research. This is followed by an account of the chemical nature of the genetic material. This includes an outline of the structure of proteins, the structure and replication of nucleic acids, and a description of the transfer of hereditary characteristics between bacterial cells by purified DNA.

A chapter is devoted to genetic mapping. This includes straightforward accounts of meiotic recombination in *Neurospora*, conjugation in *Escherichia*, transduction in *Salmonella* and recombination in the bacteriophage T4 of *E. coli*. The author mentions that the mapping procedures in diverse organisms have a formal similarity in that the relative positions of genetic sites are deduced from the observed frequencies of recombinant progeny. But the dependence of a recombination measure on the particular genetic system is not sufficiently emphasised; elementary students often incorrectly assume that recombination data in all organisms is fully comparable and expressed in some fundamental recombination unit. In most organisms genetic maps are based on analysis of recombinants; in *E. coli* interrupted mating provides a second completely independent method of assigning a linear order to gene sites. The fact that both independent methods result in an identical map should be stressed in a text of this kind.

The methods for inducing and isolating mutants are described together with a very clear account of the molecular basis of chemical mutagenesis. It is a pity that no mention is made of the ability of mutagenic agents to cause large scale changes in the genetic material such as deletions, translocations, etc., although no broad generalisations can be made about the basis of these phenomena.