

which some defend, but I deplore ; but even within each bibliography they appear scattered at random, sometimes among a hundred entries or more, an arrangement which is not easily defensible.

These, however, are minor criticisms. It would be unnecessary to make them, were not the quality of this book a matter of consequence to a wide circle of biologists and medical practitioners. E. B. FORD.

THE DISTRIBUTION OF THE HUMAN BLOOD GROUPS. By A. E. Mourant, M.A., D.Phil., D.M. With a foreword by H. J. Fleure, F.R.S. Oxford : Blackwell Scientific Publications. 1954. Pp. xvii+438, 4 text figures, 9 maps. 42s.

In the second edition of *Genetics and the Origin of Species*, published in 1941, Dobzhansky states : " The geographical distribution of the blood-groups in man has been studied in more detail than any other instance of geographical variability ". Dobzhansky, like many other workers since that time, was able to consult Boyd's invaluable compilation, published as a volume of *Tabulæ Biologicæ* in 1939, which covered all anthropological blood-group data up to 1938. At that time only three systems were known : ABO, MN and P. Data on MN were somewhat scanty and the P system was, and remains, difficult to work with. During the past sixteen years the accumulation of further data has become enormous. Published ABO groupings run into millions ; six new blood-group systems have been discovered, all of which show large or very large differences of gene frequencies in different parts of the world ; the Rhesus system, with its genetic unit of three (now four) closely linked loci, provides a wide variety of genetic combinations, as also does the now extended MNSs system. Dobzhansky's remark could indeed be repeated to-day with even greater emphasis. The urgency of bringing Boyd's tables up to date has long been apparent, though of course the immense amount of work that would be involved was equally apparent. Boyd had indicated that he had no immediate intention of doing so himself and the task has now been accomplished in Mourant's anxiously awaited monograph. It is hardly necessary to mention Mourant's qualifications for the work. He is himself the discoverer or co-discoverer of two of the blood-group systems, to say nothing of a host of other contributions. His knowledge of every aspect of the serological field is encyclopædic, and he has long been specially interested in anthropological applications, involving detailed knowledge of a very large and scattered literature.

The book, then, must first be judged as a work of reference. We are told that it was originally intended to publish complete tables for the ABO system (after 1938). This proved too great an undertaking. Instead there is the next best thing—a complete bibliography, very conveniently arranged, with titles of papers quoted, and with its own topographical index. It is to be hoped, however, that it will ultimately prove possible to produce a supplementary volume of ABO tables, which would be of great value to many workers. For the MN system after 1938 and for all the other systems complete tables are published. These cover 80 pages. Much thought has been given to form and content and the result is excellent. The basic plan is to give the total number in each sample, with observed and expected percentage phenotypic frequencies and calculated gene frequencies. It must have been a difficult choice whether to show

group numbers or percentages ; to have shown both would have taken up too much space. The plan adopted has the advantage that the reader can compare percentage frequencies from different areas directly, while for those who want to work on the data it is a simple matter to reconstruct the original figures. The data for Rhesus are clearly grouped according to the number and kinds of antisera used, so that no ambiguity seems possible. Altogether it seems probable that the standards of completeness and accuracy, both of the bibliography and of the tables, are as high as is ever likely to be attained in an undertaking of this kind. A special word of praise should be added for the attractiveness of the lay-out and the resisting of any temptation to sacrifice clarity for the sake of saving space.

Rather more than half the book consists of a review of the present state of knowledge. The genetics of the blood-groups are briefly reviewed ; for a fuller account the reader is referred to Race and Sanger's companion volume *Blood Groups in Man*, now in its second edition. The leading variations in frequencies of the various systems throughout the world are clearly summarised without being obscured by too much detail. There is a number of excellent maps. Certain other simply inherited, or fairly simply inherited, traits are wisely included, for example, sickle-cell anæmia, Mediterranean anæmia, the ability to taste phenylthiocarbamide and the ability to smell hydrocyanic acid. It is a pity, incidentally, that this last Mendelian difference, which is sex-linked, should involve work with so dangerous a compound. There are also chapters on the grouping of bone and tissue specimens ; on the blood-groups of animals ; on the collection, preservation and transport of samples ; on the simpler methods for calculating gene frequencies ; and, finally, on some recent discoveries made after the rest of the book was written.

In *Penguin Island* Anatole France makes a remark to the effect that history is a simple matter as long as there is only one historian. With the blood-groups anthropological deductions were certainly easier as long as knowledge was effectively confined to one system, namely ABO. Not of course that it could be expected that all the blood-group systems would tell the same story ; with the exception of Lewis and Lutheran, which are genetically linked, different chromosomes are involved. There is doubtless a complex pattern of balanced polymorphism and indeed evidence is now beginning to appear showing quite high selective values, apart from antigenic properties. One or more systems may tell one story, another system a second story, others may give parts of a story. The B gene indicates outward spread from central Asia and perhaps also from Africa ; the O and A genes the successive waves of invaders in the British Isles ; one Rhesus compound gene, cDe, very common in Africa and nowhere else, gives a clear picture of negro influence ; many systems combine to indicate the uniqueness of the Lapps and the Basques. Clearly attempts at synthesis are very difficult at present. Mourant makes that attempt in one chapter, but he can hardly be blamed if the result is somewhat nebulous. More data yet will have to be collected, and gene frequency changes in response to selective pressures and environmental differences better understood, before a convincing synthesis is likely to be forthcoming. Nevertheless, even if emphasis has shifted away from genetic drift and towards selection there are plenty of indications that changes in gene frequency must be slow. As Mourant points out, the Basques and the Lapps, known to be distinct

ethnic groups, are highly individual in many of their frequency patterns, while by contrast Western Europe as a whole, with all its varied environmental conditions, presents several pictures of broad uniformity. What evidence there is points to very low rates of mutation of blood-group genes, and very large bodies of ABO data do not reveal any difference of frequencies over an age span of two generations or more. There is, in fact, every reason for continuing to believe that blood-group frequencies can provide valuable evidence on human ancestry and migration over a period of at least some thousands of years.

The Rhesus maps are perhaps open to criticism. These show the frequencies of the elementary genes, C, D and E, which are serological and not genetic units. Maps showing frequencies of the compound genes would be more meaningful, though it is easy to see the difficulty of providing them when the data refer to various levels of completeness, ranging from the use of one antiserum upwards. It is to be hoped, however, that they can be included in the next edition.

The book can be warmly recommended to anthropologists and geneticists as well as to the general reader who wants to have a clear, up-to-date account of the anthropological aspects of the blood-groups. To the research worker the tables, the bibliography and the practical directions will prove invaluable.

J. A. FRASER ROBERTS.

**HUMAN HEREDITY.** By J. V. Neel and W. J. Schull. The University of Chicago Press. 1954. Pp. 361. \$6.

The great advances that have been made in our understanding of the genetics of the human blood groups during the past decade and the changing emphasis in medical research from infectious and contagious disease to pathological conditions in which genetic factors are of more importance have led to a considerable expansion of interest and work in human heredity. In North America, in particular, a number of centres for research, teaching and counselling in human genetics have been set up in recent years and, of these, one of the largest is the Heredity Clinic at the University of Michigan. Drs Neel and Schull, two members of this clinic, have now written a book on human heredity for the "advanced and competent student in biology and medicine and for researchers and theoreticians in this field." There are few texts on this subject and one that contributes to an understanding of the principles and methodology must certainly be welcome.

The book commences with eight chapters devoted to the bases of genetics and probability theory. These are followed by nine chapters dealing with the genetic theory of continuous variation, the detection of linkage in man, mutation, physiological genetics, statistical estimation and tests of significance, analysis of family data, population genetics, twins, genetics and epidemiology (in this order), and finally three chapters on genetic counselling, eugenics and medico-legal applications. The reader will perhaps be surprised that there is no chapter devoted to blood groups but, if he is patient, he will find much of the relevant material scattered in chapters 8, 13, 15 and 19.