proceeds with an intensity such as was not even suspected in Darwin's time.

The monograph by V. P. Eфроimson will no doubt be of interest to British scientists.

V. G. GALAKTIONOV

The Genetics of Human Populations. By L. L. Cavalli-Sforza and W. F. Bodmer. (Pp. xvi+965; figures+tables. £10.00.) San Francisco: W. H. Freeman and Company. 1971.

Since C. C. Li wrote 'Population Genetics' in 1954, there has been no book in English to compare with its thorough yet elementary exposition of the theoretical principles of the study. Certainly there has been no book that set out the theory in the light of available data on the genetics of human populations. This volume by Cavalli-Sforza and Bodmer is therefore doubly welcome, first for presenting an up-to-date compendium of population genetics theory, and secondly for illustrating that theory by reference to ample example from human biological data.

After a preliminary explanation of basic concepts, the book proper starts with chapter II, dealing with Hardy-Weinberg equilibrium. Discussion of deleterious mutation, its increase with parental age, its balance by selection and the approach to equilibrium states, is followed by 2 chapters on polymorphism, the conditions for balance and its kinetics, illustrated in detail by the haemoglobin polymorphisms, while X-linked polymorphisms are illustrated by G6PD deficiency. Four human polymorphic systems, the ABO and Rh blood groups, the HLA tissue antigens, and the Gm groups are discussed in detail. In chapter VI appears a discussion of demography, showing how, for example, population size, structure, distribution, birth and death rates, and genetic evolution may be examined through quantities such as Crow's index of opportunity for selection, for comparing the fertility and mortality components of selection in populations, and the intrinsic rate of increase applied in the measurement of selection.

Another unusual inclusion is the discussion of the fitness flow sheet, which provides the basis for computer predictions of evolution by natural selection and especially of the utilization of vital records through record linking. Discussion of inbreeding, its measurement and consequences, particularly in terms of the genetic load, heralds further departure from the ideal population of earlier chapters to the more real situations of limited population size, the resulting equilibrium situations that may result, movement of genes, and analysis of migration. The analysis of quantitative characters in chapter IX examines genetic models of quantitative variation, interaction with environment, partitioning the genetic variance, the analysis of threshold characters, and the use of twins in analysis. Sex determination and the evolution of sexual dimorphism is followed by a chapter on human evolution, racial differentiation, and methods

of phylogenetic analysis. The final chapter is more philosophical, discussing eugenics, genetic engineering, and the effects of changing society.

The book is expansive, clearly and competently written, and well illustrated. Taking its origin in courses given by the authors, mainly at Stanford, its concentration on particular subjects reflects their own interests and enthusiasms. Perhaps that is why it is so consistently readable—an unusual quality in a volume of this size. Criticism can only be levelled at minor points, eg, are not all individuals of a species descended from an ancestral population, not a common ancestor (p. 341)? Work on the HLA system is progressing so rapidly that for example Table 5.18 where only 5 of the LA-series and 4 of the 4-series of alleles are listed is already out of date. But the many useful points outweigh the few disadvantages. A particularly useful feature of the book is the provision of worked examples at the end of each chapter and massive appendices, the first devoted to statistics and probability, the second to segregation and linkage analysis in human pedigrees and the estimation of gene frequencies, and the third to a list of sample problems. The book is to be strongly recommended for use as a student text for any course on population genetics, for general reference.

D. F. ROBERTS

Early Diagnosis of Human Genetic Defects—Scientific and Ethical Considerations. (Fogarty International Center Proceedings No. 6.) Edited by Maureen Harris. (Pp. ix+229; tables and figures. \$2.50.) Washington: Health, Education, and Welfare Publications. 1972.

The study of amniotic fluid cells as a means of preventing serious hereditary disorders dates from the mid-1950s when it was first reported that the sex of the fetus could be determined from sex chromatin studies on amniotic fluid cells. The importance of this in families at risk of having a son with a serious X-linked disorder was obvious. Some 10 years later the first successful culture of amniotic fluid cells was reported which opened up the possibility of determining the chromosome constitution of the fetus. Finally in 1968, Nadler showed that certain inborn errors of metabolism could be diagnosed antenatally by studying the biochemistry of cultured amniotic fluid cells. Since then the subject of antenatal diagnosis has developed rapidly, and gradually the potential value as well as possible limitations have become clearer.

In 1970, a symposium, sponsored by the John E. Fogarty International Center for Advanced Study in the Health Sciences, was held in Bethesda and devoted to the problems of antenatal diagnosis with contributors mainly from the United States. The proceedings reflect well the atmosphere of the meeting which was highlighted by the discussions which have been reported in full and often contain interesting information. The areas covered include the technique and complications of, and indications for amniocentesis, and the cytogenetic and biochemical problems associated with antenatal diagnosis.

Some chapters, however, seem only loosely connected with antenatal diagnosis (eg, screening for inherited traits, detection of heterozygotes). There is also considerable overlap between chapters and the lack of an index makes it difficult to find information. The last 2 chapters on the legal (Sadler) and eugenic (Neel) implications of antenatal diagnosis are very interesting, but no one but a lawyer would be able to make sense of the references at the end of the legal chapter.

This book is a readable and inexpensive account of work being carried out by some of the best known investigators in antenatal diagnosis and related fields. It is unfortunate, however, that there is a certain lack of cohesion and uniformity in the various presentations.

ALAN EMERY

Genetical, Functional, and Physical Studies of Hemoglobins. Edited by T. Arends, G. Bemski, and R. L. Nagel. (Pp. viii + 293; 88 figures + 38 tables. £8.80.) Basel: Karger. 1971.

This is the proceedings of the First Inter-American Symposium on Hemoglobins held in Caracas in December 1969. The meeting brought together workers in many different disciplines who had in common an interest in the haemoglobin molecule.

The book falls into 3 sections on the geographic distribution and genetic problems of haemoglobins, the structure and function of haemoglobins, and physical studies of the haemoglobin molecule. The first section deals primarily with the occurrence and incidence of abnormal haemoglobins and of thalassaemia, and presents information from Mexico, Jamaica, Brazil, El Salvador, Colombia, and Venezuela. These form a valuable statement on the extent of haemoglobinopathies in this part of the world, much of which was not previously available in the English language. Two observations of especial interest were the rarity of abnormal haemoglobins among the indigenous Indian populations of Mexico, Colombia, and Venezuela, and the surprisingly high frequency (13.6% in Colombia) in certain selected populations.

The middle section describes studies on the function of normal haemoglobin including the properties of haemoglobin subunits, the effect of pyridoxylation and of 2,3-DPG on haemoglobin function, the oxygen binding sites of haemoglobin, and certain functional aspects of ligand binding. The ways in which the abnormal functional properties of certain haemoglobin variants add to our knowledge of haemoglobin function are illustrated in studies on the M haemoglobins and on haemoglobin Gun Hill.

The last section deals with the physical properties of the haemoglobin molecule and of some variants investigated by procedures which included electron paramagnetic resonance (EPR), electron spin resonance (ESR), nuclear magnetic resonance (NMR), circular dichroism (CD), and far infra-red spectroscopy. The proceedings are well printed and illustrated and form a

useful review of the knowledge and investigative approaches to the structure and function of the haemoglobin molecule. It can be recommended to all workers in this field.

GRAHAM SERJEANT

Trisomy G/Normal Mosaicism. A Cytological and Clinical Investigation. By E. S. Sachs. (Pp. vii + 93; 18 tables + 17 figures. Dfl. 19.23.) Leiden: H. E. Stenfort Kroese. 1971.

The phenotypical effects of trisomy G/normal mosaicism are of great interest in the phenomenology of cytogenetics. As well, they are of practical diagnostic importance to the clinician. It is possible that they may also be of significance to the clinician from a predictive point of view as regards development, although there has been considerable variation of opinion with respect to possible correlation between intelligence and the percentage of abnormal cells. Moreover, there is some evidence that a shift of proportions of cell lines may take place after the age of between 1 and 2 years, when, it has been said, as a rule equilibrium is reached. This poses the interesting question as to whether or not such fluctuations influence the course of development.

The study of trisomy G/normal mosaicism from both a cytogenetical and a clinical point of view has been hampered not so much by the relative paucity of material as by the means by which the subjects are ascertained. Cases that have been investigated have for the most part come to light by virtue of abnormality in themselves or in their offspring. It is quite possible that the material that has become available in this way accounts for only part of a much wider spectrum of clinical variation spreading into the normal range. The patients in the present study are no exception to the general rule of ascertainment through abnormality, though they were not necessarily discovered because a diagnosis of mongolism was suspected. Five of the 10 trisomy G/normal mosaic patients in this study were detected during karyotyping of 38 mentally retarded patients with multiple congenital anomalies and retarded growth; 3 were discovered during investigation on the basis of a dubious diagnosis of mongolism, and the chromosomes of 2 had been studied because they were the first mongoloid child of a young mother.

The group of 10 trisomy G/normal mosaic patients were studied together with a group of trisomy G patients and a group of normal controls. Clinical parameters studied included body height, cranial circumference, upper/lower body segment ratio, and 10 physical signs of diagnostic value in mongolism. Special investigations were made of dermatoglyphs and the radiology of pelvic bones. Maternal ages and birth weights were compared. Histochemical and biochemical assay of alkaline phosphatase activity of leucocytes was carried out, also fine-structural studies of the granules of the neutrophil granulocytes. Unfortunately by virtue of their means of