The use of human blood groups in classification is referred to in chapter eight, "The New Look in Physical Anthropology." The author performs a useful service in pointing out that use of blood group evidence is supplementary to the earlier systems of classification. Some persons may wish to expand the discussion of blood groups and show the places in which they have contributed to sharper or more sensitive classifications and also to an understanding of the genetic process of race formation. The limitations of classification, greater use of genetic principles, selection of measurements appropriate to the problem at hand, better use of statistics, resort to experimental testing and sounder formulation of theory are among the points discussed in this characterization of contemporary physical anthropology. The section entitled, "The Phenotype Makes a Comeback," will be found to be most useful and one that is long overdue. The concept of population, the meeting ground for the use of phenotype, genotype and ecological relations, is emphasized and attention is called to the fact that the forces promoting changes in isolated populations are the same as those which have produced evolution. Studies in human constitution, forensic anthropology, growth, changes in the bodily form of migrants, applied physical anthropology and other important topics are to be found in this chapter or the one preceding.

A discussion of the implications of tool-making, the development of symbolic behavior and cultural versus biological values, contained in chapter nine, concludes this treatment of human biology.

The author has provided an excellent framework upon which particular teachers may enlarge, or from which they may diverge and still have a point of reference within the text. Titiev states that most of the biological material has been included "with a view to clarifying the steps by which man came to have a distinctive body, one capable of devising and continuing culture." This treatment is one with which physical anthropologists will find they can live very comfortably and use to good advantage in introductory courses. It establishes a new trend in providing more cogently and skillfully organized data and inferences from physical anthropology which are essential to a sound appreciation of human biocultural achievements.

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CLINICAL GENETICS. Edited by Arnold Sorsby. Butterworth and Co. (Publishers), Ltd., London, England. The C. V. Mosby Company, St. Louis, Missouri. 1953. Price $17.50.

Clinical Genetics is the first major *critical* survey work on human, or more accurately, medical, genetics to appear in English. Arnold

Sorsby, the editor, has elected to develop the subject of medical genetics along two lines, theoretical and clinical. On the whole he has been eminently successful. The task, however, of editing and compiling a compendium such as this is not without risk particularly with regard to evenness and balance in presentation. Herein lie the major deficiencies in the present work.

It is clearly stated in the preface that this is not a textbook of human genetics, and that it is assumed that the reader will have some familiarity with basic genetics. This would account for some unevenness in presentation. The reviewer assumed, however, that this book is directed not only toward the professional human geneticist but also to the informed physician or layman who desires some knowledge of the types and kinds of problems which arise in medical genetics, and some idea as to current thinking in this field. The latter individuals can only be misled when they see more space devoted to human cytogenetics than to the biometric evaluation of data, and as much space to the evaluation of linkage as to clinical varieties of inherited disease. They will be no less misled as to the criticalness of current thought when they see a 115-year-old pedigree, largely of hearsay evidence, explained in terms of attached-X chromosomes, a phenomenon which has not been cytologically demonstrated in man, when the more obvious inadequacies of the pedigree are overlooked. In this review, since space is at a premium, we shall concern ourselves primarily with the theoretical considerations, an area where, presumably, the clinician would be least qualified to adequately appraise the statements and evidence presented.

Under "Theoretical Considerations" appear 10 chapters variously entitled "Clinical Varieties of Genetic Disease," "Penetrance and Expression," "Detection of Genetic Carriers of Inherited Disease," "Twin Studies," "Sex Limitation," "Polygenic Inheritance," "Evaluation of Linkage," "Mutation," "Biometric Evaluation of Findings," and "Experimental Methods (Cytogenetics, Chemical Genetics, and Comparative Pathology)." The list of authors is no less impressive than this subject list, and in the main, their contributions are adequate if not always stimulating. Two exceptions to this generalization are Koller's and Dahlberg's chapters. We shall return to these chapters in a moment, but first let us consider some minor objections to the other chapters in this section.

Waterhouse (Chap. IV, p. 39) calls attention to the variation in DZ twinning with maternal age, and the observation that the rate of DZ twins is appreciably lower than the rate of MZ twins among offspring born to mothers under 20 years of age. He suggests then that "the low rate of DZ twinning found in some Eastern countries (Japan, for example) may be explicable on the basis of a relationship sensibly the same as that depicted in Figure 6 (maternal age

effect), taken in conjunction with the early age of marriage customary in such countries." For the past 5 years the reviewer has been associated with the atomic bomb follow-up studies on the populations of Hiroshima and Nagasaki. One outgrowth of these studies has been the examination of the products of some 85,000 pregnancy terminations. Two facts of interest here emerge from these examinations: (1) the twin rates in Hiroshima and Nagasaki are sensibly the same as those Komai and Fukuoka have reported for other regions of Japan, and (2) the mean maternal age at birth of the first child is 24.127 $\pm$ 0.042 years, a figure not markedly different from that characteristic of the U. S. A. Moreover, less than 1.5% of the births in Hiroshima and Nagasaki occur to mothers of less than 20 years of age. These observations suggest that Waterhouse's thesis, though interesting, is not valid. In the same section (p. 44), it is flatly stated that the most effective test of zygosity is a skin graft. The reviewer is aware of no large body of human data which would support this assertion. Moreover, since skin grafts are successful in fraternal twin cattle when they are erythrocyte mosaics, plus the fact that such mosaics are known to occur in man, the skin graft test does not seem a sufficient condition in determining zygosity.

As a clinical illustration of a simply inherited sex limited trait, Ford (Chap. V, p. 48) cites Snyder and Yingling's data on pattern baldness. This is an unhappy choice since it can be readily shown that Snyder and Yingling's data do not agree with an hypothesis of a pair of alleles one of which is dominant in one sex, but recessive in the other. Under such an hypothesis, the maximum likelihood estimate of the gene, say p, is the real, positive root of the cubic equation

$$p^3 - p^2\left[1 + \frac{N_f}{N}\right] - p\left[\frac{B + 2b\sigma}{N}\right] + \left[\frac{2B\varphi + B\sigma}{N}\right] = 0$$

where N is the total number of observations, N_f the total number of females observed, B the number of bald individuals observed among all individuals, $b\,\sigma$ the number of non-bald males, $B\,\varphi$ the number of bald females, and $B\,\sigma$ the number of bald males. The invariance of this estimate is

$$I = 4\left[\frac{N_f}{1-p^2} + \frac{N_m}{1-q^2}\right].$$

From Snyder and Yingling's data, one obtains as the M.L. estimate of p, 0.255195. When this estimate is fitted to the observed distribution of baldness one obtains a $X^2 = 6.816$ which for one degree of freedom is clearly significant. In short, these data are not consistent with the hypothesis they purport to demonstrate.

Mather's statement (Chap. VI) of the problems of quantitative inheritance is a realistic one although developed in terms of polygenes which some individuals may find objectionable. However, it is unfortunate that Wright's very excellent 1952 paper (The Genetics of Quantitative Variability) does not appear in the bibliography. A small error exists on page 59, $r_{p/o}$ and $r_{s/s}$ have their maximum values at one-half and not at one as stated. This is obviously an oversight.

MacGregor's treatment of the problem of linkage is somewhat startling because of the complete omission of reference to the work of Fisher, Finney, and Bailey on the detection of linkage. The treatment is somewhat sketchy, and MacGregor certainly does not carry the problem further than half a dozen introductory texts do. This, however, is probably adequate for the clinician.

The chapter on mutation is well handled, and Crew manages to dissociate himself from either of the extremist points of view with regard to the frequency of the phenomenon. It does seem, however, that somewhat more attention could have been paid to the problem of estimation of mutation rates in man. Catheside's treatment of chemical genetics is possibly overly succinct, but certainly well done. It provides an adequate, knowledgeable background for Klein's chapter on the metabolic disorders.

Dahlberg's chapter on the biometric evaluation of findings is inadequate largely for what it leaves unsaid. This is the subject matter for a much needed book in human heredity, and in the reviewer's opinion, unless the editor was willing to devote at least 100 pages of text, this topic would best have been left untreated. The problems of gene frequency estimation, age corrections, and a host of other items are not even mentioned, and ascertainment is developed and treated in a markedly pedestrian fashion omitting all reference to the maximum likelihood approach. The Weinberg and Dahlberg methods, which are given, are rarely used in England or in the U. S. A. largely because of their inefficiency. Dahlberg's was indeed a thankless task.

The most serious lapses of criticalness in the entire book are to be found in Koller's chapter on cytogenetics. Koller seems compelled to explain, in genetic terms, a number of unusual pedigrees, and to this end he trots out position effect, attached-X chromosomes, trisomy, and deletion. For only one of these, deletion, does there exist even the vaguest sort of cytological evidence that the phenomenon is occurring in man. The choice of these sophisticated hypotheses seems naive indeed when one notes that the pedigrees can be much more readily explained in terms of misdiagnoses, hearsay evidence, or inadequate techniques. More questionable is his discussion of partial sex-linkage. The latter is treated as an established fact despite such work as Sachs, and others (see Matthey).

The real contribution of this book to medical genetics lies in its appraisal of the clinical evidence. Here are discussed some 19 subjects including inheritance of morphological and physiological traits, metabolic disorders, each of the major organ systems, oligophrenia, psychiatry, endocrine disorders, infectious diseases, allergy, and cancer. It is difficult and unfair to single out specific chapters for commendation since the topics impose burdens of unequal complexity on the authors. However, at the risk of being unfair, Falls' chapter deserves mention because of the enormity of the task it imposed. The literature on skeletal abnormalities is legion, and unlike the skin, eye, and others, there exists no other major genetic summary of this system. While there are minor lapses in a number of the clinical chapters, e.g. the absence of reference to the work of von Knorre, and Melevi and Rosler on cardiac anomalies, the one section which does not meet the stardard established by the others is the one on hemorrhagic diatheses. This is a rapidly expanding field, and considerably more is known about coagulation defects than Jackson would lead the reader to believe.

One of the more or less standard features of the clinical section which pleases this reviewer is the summary of the present status of our thinking, either in terms of mode of inheritance or empiric risk of occurrence or recurrence, which follows the discussion of the majority of the inherited diseases. These summaries will be of immense value to those geneticists and physicians called upon to do genetic counseling.

Clinical Genetics, while it does not rise to the stature of the *Handbuch der Erbbiologie des Menschen* as a reference work, deserves and will undoubtedly earn a prominent position in the library of every human geneticist.

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DYNAMICS OF GROWTH PROCESSES. Edited by Edgar J. Boell. vii + 304 pp., Illus. Princeton University Press, Princeton, New Jersey. 1954. $7.50.

"Dynamics of Growth Processes," edited by E. J. Boell is the outcome of the Eleventh Growth Symposium, held in 1952. The 13 papers in this generally well printed and not too expensive volume range from virus reproduction and protein synthesis, to the different curves of population growth. Of particular interest to physical anthro-