BLOOD GROUPS IN MAN. By R. R. Race and Ruth Sanger. Blackwell Scientific Publications, Oxford, England. 1950. xv + 290 pp.

This book is by far the best introduction to, and general up-to-date account of, the subject of blood groups with which the reviewer is familiar. The treatment is clear and concise, yet amazingly complete. There is no dead wood, and every page could be read with profit.

The authors, who are among the most active and productive workers in the field, and who have contributed notably to recent advances in knowledge (we may mention C<sup>w</sup>, Lutheran, Kell and Levay), write with the assurance born of authoritative knowledge, and the clarity we have come to expect of British scientists.

As is natural, the majority of the book is devoted to the modern work, and the subject of Rh occupies 95 pages; 39 pages are devoted to still more recent discoveries. Nevertheless, the older ABO and MN systems are fully treated, the expansion of the MN system due to the discovery of anti-S is explained, and the anti-s serum (which has since been found) "confidently predicted."

In the chapters on Rh the authors present both the Wiener and the Fisher-Race notations fully and in a most impartial manner.

Methods of testing are well discussed, although the book does not purport to be a laboratory manual, and the clinical and medico-legal aspects of the subjects are clearly presented.

Although no advanced mathematical methods are used, the book is noteworthy for the clearly presented methods of calculation of gene frequencies, "usefulness" of the various systems, and other such problems. The authors are obviously well equipped themselves to deal with these subjects, and they have had in addition the privilege of consultation with R. A. Fisher, the sun of whose genius has "illuminated the English blood group work."

This book, together with the forthcoming companion volume on the distribution of the human blood groups by Dr. Mourant, constitute a pair which no physical anthropologist who makes use of genetical methods can afford to be without.

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ADVANCED STATISTICAL METHODS IN BIOMETRIC RE-SEARCH. By C. Radhakrishna Rao. John Wiley & Sons, Inc., New York, N. Y. 1952. 390 pp.

Until roughly 30 or 40 years ago the development of biometry and physical anthropology had this in common: certain pioneers in sta-

tistics (Quetelet, Galton, Pearson) were deeply concerned with anthropometric materials and anthropological problems. But since about 1918, when R. A. Fisher took the post of statistician at the Rothamsted Agricultural Station, biological statistics has become more and more concerned with experimental materials and designed problems. Thus there has developed a gap between the interests, problems and materials of anthropology and modern biometry. Most contemporary biometricians show little active interest in the traditional data and problems of anthropometry. "The statistician is no longer an alchemist expected to produce gold from any worthless material offered him. He is more like a chemist capable of assaying exactly how much of value it contains, and capable also of extracting this amount, and no more" (Fisher).

Perhaps because C. Radhakrishna Rao — while taking advanced training in mathematical statistics — worked as a research assistant in the Anthropological Museum at Cambridge, his present book has a vicarious significance for physical anthropology. It is the first treatise on mathematical statistics in nearly 50 years in which the illustrative problems and materials are mainly those of anthropology. Rao's book is packed with examples of the quantitative analysis of data on man, mainly physical man, and mainly his bones.

It is a commentary on the intellectual status of anthropometry that statisticians with no training in anthropology can understand Rao's book, but anthropologists with no training in statistics cannot. The title is accurate in containing the adjective "advanced." It is a tough book. But nearly all of the 390 pages are pertinent directly to the analysis of anthropological materials. For a medium-sized book, this work contains not only an impressive amount of statistical theory but also a large number of problems worked in full to illustrate computational methods.

The text is divided into 9 chapters, the first being devoted to procedures in modern algebra, especially matrices. The second chapter takes up binomial, multinomial, Poisson, normal, gamma, beta, Cauchy, and Personian  $P_{\lambda}$  distributions. The presentation of these distributions is concise; non-statistical readers will need to supplement the material given by Rao with the fuller treatment afforded by other statistical works. Chapter three deals with least square methods of estimation, introduces sampling theory with a discussion of "Studentization" and goes on to tests on linear hypotheses. The 4th chapter gives an introduction to general theories of estimation, maximum likelihood and certain other methods of deriving asymptotically best estimates. Problems of specification and homogeneity are considered in chapter 5. Tests of homogeneity of variances and covariances discussed in chapter 6 are preliminary to a detailed exposition of multivariate analysis in chapter 7. Chapter 8 considers methods

of minimizing the errors of classification, and the problems of assigning an individual to one of several populations to which he might belong is covered in detail in chapter 9. These last methods have been much advanced by contributions from the Indian Statistical Institute, Calcutta, where Rao is Professor of Statistics.

The book is well printed. The few errors in the text do not diminish its general utility. The statement (p. 33) on the sum of two binomial variates is not sufficiently restricted and the statement (p. 36) on the sum of Poisson variates is unduly restricted. The definition of the partial correlation coefficient (p. 69) is unusual as is the definition (p. 144) of a minimal set of sufficient statistics. The text is confusing (p. 276) on the difference between fiducial limits and confidence intervals. Rao's consistent use of pivotal reduction of matrices keeps the text compact, but for some problems other methods, for example triangular reduction, provide more computational economy. Anthropologists would benefit had the book contained a discussion of the problem of scale and of transformations in scale, and had it used more genetically oriented illustrations.

The last two chapters (about one-third of the book) on statistical inference applied to classificatory problems is the type of statistical procedures which are required in order to make objective interpretations of the relationships of human populations using anthropometric data. It seems likely that procedures of this sort, together with a genetic interpretation of quantitative variability in man, and in association with full use of such gene frequency information as can be made available, could achieve one of the central objectives of physical anthropology — a genetic classification of the living varieties of man.

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RACE CROSSING IN MAN: THE ANALYSIS OF METRICAL CHARACTERS. By J. C. Trevor. 45 pp., 1 plate, 1 figure. Cambridge University Press, New York. 1953. \$2.50.

In this finely printed Eugenics Laboratory Memoir XXXVI from the University of London, Trevor brings together the published metric observations on hybrid groups (American Negroes, Jamaican "Browns," Half-Blood Sioux, Ojibwa-Whites, Yucatecans, Rehoboth Bastaards, Kisar Mestizos, Norfolk Islanders, and Anglo-Indians) and compares these with the anthropometry of the respective "parental" populations. The methodological difficulties inherent in a study of this sort in view of the limitations of the available material, are clearly perceived and enunciated. This aspect of the memoir is itself a per-