a framework which does not exaggerate their importance. This is an item too often neglected and it argues much for the sincerity of the author that he takes upon himself such obligation of balancing the new and spectacular against the old and dulled. It is suitable for a three-semester course in organic chemistry and yet so arranged that it can be left safely in the hands of a student for general reading preparatory to advanced work. No literature references or questions are included in the text and the saving of space so achieved is turned to good purpose in the inclusion of material and argument. This reviewer hopes that the merit of the work will be rewarded with widespread use. It is deserving of the widest support and is the best general text in organic chemistry that he has seen for many years.

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BLOOD GROUPING

Blood Grouping Technic. By F. SCHIFF and W. C. BOYD. Interscience Press, 1942.

THIS book by two outstanding investigators in the field of blood grouping is an authoritative compilation of methods of grouping, based in large degree on the experience of the authors themselves. While the book is supposed to be a translation and amplification of Schiff's small manual which enjoyed a well-deserved popularity for a long time in Germany, it is really a new book. The arrangement of the material is quite different and the book is nearly three times as large as the German manual on account of the inclusion of much new material. It is unfortunate that Dr. Schiff did not live to see this fine book in print, but the work was capably brought to its completion by Dr. Boyd.

The monograph opens with a brief introductory chapter outlining what is known of the individual differences in human blood and the secreting factor. In the succeeding extensive chapter, the general technic of blood grouping is described in great detail, including methods for determining the four blood groups, the subgroups of groups A and AB, the M-N types and the Rh-type. Detailed instructions are given for carrying out tests not only on blood by direct agglutination and hemolysis, but also on organs and secretions by the technics of absorption, inhibition and complement fixation. In addition, full directions are given for the preparation of suitable grouping sera, including immune sera in rabbits against agglutinogens A, B, M and N. In the remaining chapters of the book, further refinements in the technic are presented from the point of view of the specialized requirements in relation to the practical applications of the tests in blood transfusion, in forensic medicine in cases of disputed parentage and for the examination of blood stains and in anthropology.

Of considerable interest is the section discussing the anthropological significance of the blood groups, especially since Dr. Boyd has made significant contributions to this subject. Among the theories mentioned to explain the differences in the present distributions of the blood groups genes throughout the world the most plausible is that favored by Bernstein and Candela that there were originally two or more races, each belonging predominantly to one or two of the four blood groups, and that the present distribution in white races arose by crossing between the original races. Boyd himself, however, proposes a monophyletic theory and postulates that man originally had a blood group distribution represented approximately by the frequencies p (A) = 0.35, q (B) = 0.15 and r (O) = 0.65, and that as man spread to the four corners of the world, isolated groups by chance lost largely one or two of the three genes. The weak point in this theory is that no attempt is made to explain how the original blood group distribution arose, nor to apply to man the observations on apes and lower monkeys. To the reviewer the polemic between the sponsors of the monophyletic and polyphyletic theories appears largely academic, since undoubtedly numerous times in man's history there must have been periods of migration, isolation and inbreeding succeeded by periods of invasion and mixing of races. Accordingly, as the authors of the manual will probably agree, the choice between the two theories would depend to a great extent on the time selected as the onset of man's history as a distinct species.

All in all this book on blood grouping technic constitutes a valuable contribution and one destined to serve as a standard and authoritative reference work on the subject for a long time to come.

A. S. WIENER

SPECIAL ARTICLES

ENZYME SYSTEMS CONTAINING ACTIVE SULFHYDRYL GROUPS. THE ROLE OF GLUTATHIONE[1]

UP to now there has been published scattered information on this subject, and from time to time there have appeared observations on the presence of -SH groups essential for enzyme activity among some hydrolytic enzymes, certain lipid-splitting enzymes, several pneumococcal and streptococcal hemolysins, and a few oxidation enzymes. A comprehensive study of the presence of -SH groups essential for

[1] From the Chemical Division, Department of Medicine, the University of Chicago.