the most part, of a mechanical nature. In proportion as they are understood, these forms of disease become amenable to an efficient treatment; it is mechanical, it is surgery.

The studies of the ætiology of diseases revealed and continue to reveal many of the foreign originators of disease, the animal and vegetable invaders of the living organism. This new and lucid knowledge led again to some effective measures in the treatment of diseases, it led to clear plans in preventive medicine, it gave means to the surgeon to enter with impunity into the interior of living organisms, and in a few instances it discovered actual remedies for non-surgical diseases.

But most diseases are something more than mechanical disturbances, or exclusively anatomical changes. There is, in the first place, that large group of so-called functional diseases which has no pathological anatomy, and for which clinicians have very little interest. But even those numerous diseases in which the post-mortem examination revealed distinct anatomical changes were only results of the advanced stage of the disease. The disease during life consisted primarily surely in disturbances of a functional character, in reactions to foreign causes, reactions of living energies, the physiology of which we have possibly as yet not even an inkling of. The so-called organ physiology which appears to the teachers of physiology to be so extensive that it can hardly be taught to students of medicine in one year's lectures, is of astonishingly modest assistance to the understanding of the actual processes of disease. For instance, in the present knowledge of the entire section of the diseases of the respiratory tract, physiology has hardly any share. The knowledge of the few physiological principles which are applied there can be acquired in one hour's instruction. The extensive knowledge in this chapter of pathology is essentially of a morphological nature. Do the functions of the involved organs take no part in these pathological processes? Most certainly they do; but we know too little of it, and the clinician passes over the gap with some makeshift mechanical explanations. The same is true in neurology; in fact, in nearly every chapter of internal medicine. It is impossible to dwell here on the particulars of our subject. What is the result? First-class clinicians employ their brilliant faculties in continually developing the morphology of diseases and their diagnosis. But treatment? There is either a nihilism pure and simple, or some sort of a symptomatic treatment is carried on with old or new drugs upon a purely empirical basis. Or there is a great deal of loose writing upon diet, air, water, psychotherapy and the like, and a great deal of semi-popular discussion in international, national and local meetings and popular prize essays on the best methods of treatment—with a net result of only a very modest actual benefit for the poor patient, who in addition to his affliction has now to feel the tight grip of the modern health officer. There is no efficient treatment of internal diseases in any way comparable with the specific surgical treatment of mechanical diseases, no specific quelling, correcting or curbing of primarily functional disorders. And there never will be such a specific functional therapy before there will be a physiology which, like physics, will be only too glad to meet with many exceptions in order to properly understand all the rules by which the energies of all grades of living phenomena are guided.

S. J. Meltzer.
Rockefeller Institute.

SCIENTIFIC BOOKS.

Blood Immunity and Blood Relationship. By George H. F. Nuttall, M.A., M.D., Ph.D., University Lecturer in Bacteriology and Preventive Medicine, Cambridge. In-

cluding original researches by G. S. GRAHAM-SMITH, M.A., M.D., D.P.H., Camb., and T. S. P. STRANGEWAYS, M.A., M.R.C.S. Cambridge University Press. 1904.

The recent study of the mechanism of immunity begun by Bordet and Ehrlich has opened an entirely new chapter in biological science and has already yielded some practical results of great interest and importance. None of these practical aspects of the new science has been so prolific of immediate results as the study of the precipitins. These specific proteids are developed in the animal body by injection of foreign proteids, as blood-serum, milk, bacterial emulsions, etc., and their presence in the blood of the treated animal is indicated by the fact that when the blood-serum is added *in vitro* to the alien blood or to the bacterial emulsion used in the injections, a precipitate occurs from the union of the newly-developed precipitin and the foreign proteid. The precipitins are highly specific, acting only on the proteid injected, so that when a rabbit has received several injections of human blood, its serum precipitates the proteids of human blood, but not those of beef, sheep or any other lower animal blood. The first application of this principle has developed the medico-legal serum test for blood which has become fully established as a reliable test in forensic cases.

Nuttall and his associates were among the first to see the possibility of establishing by means of the precipitin test a far more accurate scheme of relationships in the animal kingdom than has been possible by any other method, and the results of their studies, extending over a period of three years, are presented in detail in the present volume.

The elaborate scope of the work may be judged by the fact that Nuttall himself prepared in the rabbit anti-sera for the bloods of thirty different animals and records no less than sixteen thousand tests on the blood of nine hundred animals. Only the barest outline of the many important results of this extensive work can here be indicated.

In general, Nuttall succeeded in establishing a close blood relationship in different classes of animals which zoologists have grouped together chiefly on anatomical grounds. Among the most interesting of these relationships is that between the Anthropoidea. It is a somewhat startling verification of the consanguinity of man and the higher monkeys that the blood of the chimpanzee gives 90% as much precipitum with humanized rabbit serum as does the blood of man himself, while the blood of lower monkeys yields only one fourth or one third as much. The chimpanzee thus appears much more nearly related to man than to the common Rhœsus monkey. Another interesting result is the observation that anti-pig serum is remarkably diffuse in its action, affecting considerably the blood of primates and showing that the porpoise has correctly been called the 'sea hog.'

Numerous conflicting results are recorded, which is not a matter of surprise, considering that the specimens of blood were collected on blotting paper, often under great difficulties, and sent by mail from nearly all parts of the world. As the author states, only a beginning of the study of blood relationships has been accomplished and much remains to be done in determining the exact standing of different animals in their respective classes. It is of fundamental importance to have established the fact that the precipitin test is universally applicable as a method of zoological rating, and may have much influence in elucidating many problems of evolution. It may be suggested that new points of view may, perhaps, be secured and former results be effectively controlled by comparing the action of anti-sera for the same blood prepared in other animals as well as in the rabbit, which is the animal almost exclusively employed by workers in this field.

The method of estimating the degree of reaction by measuring the bulk of precipitate is one of the many important contributions of the author to the technics of serum work.

Graham-Smith contributes an extensive study of anti-sera among lower vertebrates and arthropods, and an important critical study of the medico-legal application of the test. This investigator more than any other has demonstrated the possible sources of error in the medico-legal use of the test, so that

familiarity with his work is essential for any one who undertakes the employment of the serum test for human blood.

Not the least valuable and laborious feature of the volume is the very complete critical summary of the literature of the precipitins, for the preparation of which the thanks of all students of the subject are due. J. Ewing.

Praktikum für morphologische und systematische Botanik, Hilfsbuch bei praktischen Uebungen und Anleitung zu selbständigen Studien in der Morphologie und Systematik der Pflanzenwelt. By Karl Schumann, late curator of the Royal Botanical Museum at Berlin. Jena, G. Fischer. 1904.

Professor Karl Schumann's posthumous text-book of morphological and systematic botany is a stout imperial octavo of six hundred pages. The work was largely in type at the time of Professor Schumann's death, and in accordance with his wish it has been brought to completion under the editorial supervision of his able colleague, Professor Max Gürke. The plan of the volume is to illustrate the facts of the morphology and classification of the flowering plants by describing in considerable detail seventy-nine species, selected to typify the most important families and arranged in the general sequence of their flowering seasons. The work is the result of wide experience and intensive study in the fields covered. By its wealth of carefully recorded facts, its conscientious detail and perfect lucidity it must at once command respect. As a laboratory guide, however, it will scarcely prove successful, at least in America. Of the plants treated, the majority are European species not generally familiar, even in cultivation, on this side of the Atlantic. It is true, the descriptions would in many instances apply with a fair degree of accuracy to nearly related American species of the same genera, yet the correspondence would be imperfect and perhaps misleading. Furthermore, students of one nationality doubtless differ somewhat in their psychological traits from those of another. It may well be, therefore, that a type of text-book suited to one nation may not be equally adapted to another. In fact, it is the general experience in America that a laboratory guide in order to be effective in holding the attention of the student and stimulating his interest should present its subject not by long and full descriptions, but rather by indicating methods of observation and leading the student to examine and discover for himself.

One of the chief defects of the book under discussion is that, dealing as it does with an arbitrary number of unrelated species, it would leave the student with but a vague idea of the relative systematic importance of the morphological features examined, since in general he would be unable to distinguish the traits characteristic of and restricted to the particular species from the more general features common to other plants of the same genera and families. There is, in fact, little effort to correlate and draw together by any form of systematizing or generalization the morphological characteristics, which are described separately for each of the seventy-nine species.

The introductory matter is very brief, dealing chiefly with the simple microscope and the ordinary methods of plant dissection. The closing pages are, however, devoted to some excellent hints to students entering upon monographic and floristic work. There is also a list of the chief floras of different lands. This seems to have been prepared with some haste, since it contains a number of clerical or typographical errors. Surely a work which urges (p. 578) the careful verification of all citations should not set the poor example of mangling names of well-known authors, as, for instance, 'J. W. Hooker' (p. 599), 'Nathaniel Britten' (p. 600), or 'N. B. Hemsley' (p. 602). It is fair to say, however, that many such trifling slips should be pardoned in a large and posthumous work.

The volume is copiously illustrated from drawings on granulated paper executed by the author's daughter. The figures are exceedingly clear and bear ample evidence of fidelity to nature. It is a pleasure to notice that they are all fresh and original, none having been borrowed from any other work.

B. L. R.