library service. In this manner it would be possible for many reference libraries to extend the scope of their usefulness far beyond their present limits. Lastly, the lessened cost of rebinding books due to wear and tear in transit through the mails, represents a factor of great importance in estimating savings made by the wide use of the microfilm.

ATHERTON SEIDELL

MEDICOFILM SERVICE,
ARMY MEDICAL LIBRARY

QUOTATIONS

PROBLEMS CONFRONTING MEDICAL INVESTIGATORS

IN a recent address at the fiftieth anniversary celebration of Stanford University, Dr. Walter B. Cannon[1] presented some questions which deserve careful study. The shift in age grouping of the population, with increasing percentages of the elderly and the aged, now widely recognized as a fact, has presented the medical profession with a series of new problems. As one grows older, Cannon points out, the fires of life burn less vigorously and the adjustments of bodily organs to emergencies tend to be impaired—the breath is shorter, the heart beats less effectively, blood pressure gradually rises as the years pass and becomes ill adapted to critical requirements. Are these features essential attributes of the elderly or are they the consequences of comfortable and habitual indolence? In middle age some of these effects may result from inactivity alone and can be reversed by training; is this true in the later decades? If so, should attempts be made to alter them? What, Cannon says, would be the effects if they were altered? These questions offer possibilities for useful research. Almost none of the most prominent disorders of senescence are thoroughly understood. The prevailing ignorance, it may be assumed, is largely due to lack of systematic study. The challenge presented by realization of this fact will doubtless receive many answers. Severe demands on the nervous system, which may have arisen in part from the remarkable shift in the occupation of the citizens, often result in calls for medical attention. A disorder of the brain may fail to be revealed at necropsy or under the microscope. And yet emotional upsets which leave in the nervous pathways no visible trace have concrete and obvious effects and may be the occasion for profound misery and suffering. The gradual onset of disabilities, bodily and mental, in the later years of life demands, Cannon believes, long-range studies on the possible influence of inheritance, early injuries, severe infections in childhood and youth, frustrated plans, the demands of labor and probably many other conditioning experiences. Cannon also calls attention to the disastrous cooperation of disease, pain and early death when warring hosts or nations battle against nations for supremacy. International developments unquestionably have affected medical research in a warping of scientific activities away from untrammeled pursuits toward problems of military significance. Medical investigators, however, by learning the nature and cure of malnutrition, by devising appropriate treatment for shock and hemorrhage and in many other ways have served to mitigate the torments and ravages of warfare. One of the results of the present war already has been a more intimate association of a highly desirable nature with medical investigators in Latin American nations. Finally Cannon emphasizes as one of the biggest problems facing medical investigators the filling of their own ranks. This is indeed primary, and, unless well-equipped recruits can be attracted to the career of the investigator, progress will end. Cannon dwells at some length on the attractions and rewards of medical investigators, pointing out particularly one consideration eminently creditable to their efforts: "Because life and health are precious and medical research is deeply concerned with protecting life and health, the triumphs of that research are put to use without regard to any national or racial difference. . . . Even though the beneficiaries may despise their benefactors, they must receive the benefactions. . . . The conquest of a disease, it should be remembered, is a permanent conquest."—*The Journal of the American Medical Association.*

[1] W. B. Cannon, "Problems Confronting Medical Investigators," SCIENCE, 94: 171–179, August 22, 1941.

SCIENTIFIC BOOKS

THE LABORATORY MOUSE

Biology of the Laboratory Mouse. By the STAFF of the Roscoe B. Jackson Memorial Laboratory, with a chapter on Infectious Diseases of Mice by J. H. DINGLE, Harvard Medical School. Philadelphia: Blakiston Company. 1941.

THIS book is the joint work of the staff of the Roscoe B. Jackson Laboratory, under the editorship of G. D. Snell. Some chapters are short monographs on subjects in the investigations of which the Jackson Laboratory has prominently participated, while other

chapters are written more in a text-book-like fashion, summarizing wider fields of the literature. But even in the latter, investigations of the various authors were added to the study of the literature, as, for instance, in the chapter on the early embryology of the mouse by Snell, but also in the chapters on reproduction by Snell, on histology by Elizabeth Fekete, and on spontaneous neoplasms in mice by A. M. Cloudman. There are valuable contributions on parasites by W. E. Heston, and on infectious diseases in mice by J. H. Dingle. Throughout, the illustrations of these chapters are numerous and excellent. To all investigators who work with the mouse, this part of the book will be very helpful; the chapter on the histology of this species will be especially helpful, because the general text-books on histology do not as a rule contain the information needed by the student of this particular species.

The remaining chapters are short monographs dealing largely with work from the Jackson Laboratory. They concern investigations about which there might be differences of opinion. The chapter on gene and chromosome mutations by Snell will prove very useful for geneticists. The chapter on endocrine secretion and tumor formation by G. W. Woolley is a very good summary of our knowledge in this field, although the presentation is rather condensed. One might wish also that the chapter on the milk influence on tumor formation, written by J. J. Bittner, who discovered this interesting condition, might have been somewhat more detailed. It treats of a new, virus-like substance, which is of considerable importance in the etiology of the mammary gland carcinoma in mice, and which is present in the milk and certain organs of mice belonging to strains in which the incidence of this type of cancer is high. It is designated as the "extrachromosomal factor" in order to distinguish it from genetic factors which also have a part in the development of tumors.

The chapters on the genetics of spontaneous tumor formation and on the genetics of tumor transplantation, written by Little, are valuable summaries of the many interesting investigations of Little and his collaborators, in which they used closely inbred strains of mice; and by making this material accessible to other investigators, they have aided cancer research in many other laboratories. As might be expected, some of the views expressed in these chapters are controversial. To mention only some of these points: It is doubtful whether there exists an absolute distinction between these closely inbred strains and the strains used by earlier investigators, a number of which were also, to some degree, inbred. There are only quantitative differences between these various types of strains, and notwithstanding the larger number of variable factors with which the earlier investigators had to contend, they were able to establish some of the principal facts concerning the hereditary conditions underlying the origin as well as the transplantability of cancer. As early as 1912 it was suggested that the results obtained in the transplantation of tumors could be explained on the basis of Mendelian rules, by assuming the presence of multiple factors in the sense in which Nilsson-Ehle and other geneticists had used this term. However, even to-day no definite knowledge exists concerning the mode of hereditary transmission of the genetic factors active in the origin of mammary gland carcinoma of the mouse.

As to the criticism which Little has raised against the theory of the individuality differential, the justification for this criticism may be questioned; it might be held that the success or lack of success of tumor transplantations which Little has used in the analysis of individuality is not suited for this purpose. A successful transplantation of cancerous tissue is a threshold phenomenon and differs from the results in transplantations of normal tissues, which represent graded series of reactions of the host, which can be shown to correspond to the graded character of the individuality differentials in various organisms. The transplantations of normal spleen which Little and Bittner carried out in a few experiments were not controlled by microscopic examination. Furthermore, it is doubtful whether the method used for the determination of the number of factors on which the transplantability of tumors is supposed to depend furnishes valid results. The importance of such determinations may also be doubted, because the number of factors found would vary with each different combination of tumor and host. There are also serious objections to the conclusion that somatic mutations in tumors play the significant role in the transplantability and also in the origin of tumors which is attributed to this factor by Little and his collaborators.

The chapter on inbred and hybrid animals and their value in research (W. L. Russell) is a very instructive and clearly written presentation of somewhat intricate genetic problems. The term "specificity of tissues" is here, as well as in other chapters, substituted for the term "individuality differential." It is not certain that this change is advantageous. The specificity of tissues comprises several conditions, only one of which can be correlated with the individuality differential. The short chapter on the care and recording of mice colonies written by Bittner contains some very good advice for those who are interested in the breeding of these animals for scientific purposes.

Altogether, this is an excellent book, and by writing it the staff of the Jackson Laboratory has made an-

other distinctive contribution. It will be very helpful to investigators in the fields of genetics, tumors, endocrinology, as well as pathology and biology in general.

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MATHEMATICS

University Mathematical Texts. General editors, Alexander C. Aitken, D.Sc., F.R.S., Daniel Rutherford, Dr. Math. Edinburgh and London: Oliver and Boyd. New York: Interscience. *Determinants and Matrices,* by A. C. AITKEN; *Statistical Mathematics,* by A. C. AITKEN; *Waves,* by C. A. COULSON; *Integration,* by R. P. GILLESPIE; *Integration of Ordinary Differential Equations,* by E. L. INCE; *Functions of a Complex Variable,* by E. G. PHILLIPS; *Vector Methods,* by D. E. RUTHERFORD; *Theory of Equations,* by H. W. TURNBULL. Each volume, $1.50.

IN continental Europe the publishing of brief introductory texts at a low price has long been an established custom. It is very fortunate that, by constructive editorial activity, the present mathematical series in the English language was started. All the little books of the series published so far can be characterized as unassuming, straightforward, directed toward tangible facts rather than toward generalities, conscious of applications, and written by competent authors. They can not possibly give more than introductory information and they can not suffice as bases for more detailed studies. But within the limitations imposed by their small size (about 65,000 words on the average), they will serve a really useful purpose. It is to be hoped that the editors will be able to maintain the same standards in the future publications of the series.

A Treatise on Advanced Calculus. By PHILIP FRANKLIN, Ph.D., professor of mathematics, Massachusetts Institute of Technology. xiv + 595 pages. New York: John Wiley and Sons. 1940.

RIGOR, whatever this word may mean, was one of the great mathematical achievements of the nineteenth century. Only gradually has this tendency penetrated into text-books. The first great work of this kind, Jordan's "Cours d'analyse," was followed by many others, of which Hardy's "Pure Mathematics" seems to be the foremost in English. Franklin's book is an admirable attempt on a much broader scale to combine rigor with completeness in a volume of modest size. It will appeal to readers who are already well informed but want to revise and to supplement their knowledge in the light of modern precision. Not only are the traditional subjects of a book on advanced calculus covered, but also many more advanced topics are included. There is a section on the Laplace transformation, one on Poisson's sum formula, and a brief exposition of the theory of partial differential equations of the first order. The material is presented in an original way with extraordinary care.

Of course it is impossible to discuss analysis from the real number system to the Hamilton-Jacobi theory in less than 600 pages without being somewhat dogmatic. The reader who wants to absorb new material will miss a convincing illumination of motives and goal for all these deductions. The critic may take exception to points where the personal taste of the author has asserted itself in a striking way, such as in the discussion of the trigonometric functions. Or he might be disappointed to find in such a thoughtfully precise book an introductory remark on limits, where the idea of a steadily moving independent variable is mentioned without being explicitly disavowed. From Zeno to Leibniz this concept has been one of the main impediments to rigorous mathematical treatment, and its replacement by "static" concepts was the decisive step towards logical clarity in the modern definitions of limit and continuity. Of course such criticism of minor details does not matter much in view of the merits of the book as a reliable guide. The great effort embodied in this work will certainly assure it a more than transitory place in the literature and a lasting influence on those for whom it is written.

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SPECIAL ARTICLES

THE EFFECT OF SULFANILYLGUANIDINE ON THE THYROID OF THE RAT[1]

FOLLOWING the announcement of Marshall *et al.*[2] that orally administered sulfaguanidine (sulfanilylguanidine) reduces the concentration of coliform bacteria in the feces of mice, we investigated the possibility that this substance, when fed to rats on a purified diet containing synthetic B vitamins, would prevent the synthesis of additional essential nutrients by the intestinal flora. In view of Woods's[3] finding that p-amino benzoic acid interferes with the bacteriostatic

[1] Supported by a grant from The Rockefeller Foundation.

[2] E. K. Marshall, Jr., A. C. Bratton, H. J. White and S. T. Litchfield, Jr., *Bull. Johns Hopkins Hosp.*, 67: 163, 1940.

[3] D. D. Woods, *Brit. Jour. Exp. Path.*, 21: 74, 1940.