cation of the unfavorable influence of the increased hydrogen ion concentration itself. For example, 10 cc of a centrifuged one per cent. aqueous extract of ground navy beans may be observed to reduce the digestion of 100 mg of soluble starch at pH 4.7 to 16 per cent. of the uninhibited digestion at neutrality, while in the absence of the inhibitor, at pH 4.7, the corresponding value was found to be about 60 per cent. of the uninhibited digestion at neutrality.

Similar observations may be made with preparations derived from simple aqueous extracts by precipitating the active fraction with alcohol after removing most of the inert proteins by precipitation at pH 4.0. One milligram of such a preparation may decrease the digestibility of 100 mg of soluble starch at pH 5 to about 75 per cent. of that of the control at the same pH. Increasingly larger proportional amounts of the retarding fraction further increase this interference.

With the fraction employed, antiamylolytic activity is retained following repeated reprecipitation with alcohol but is markedly decreased by boiling or by treatment with kaolin. The preparations used showed antitryptic[1] as well as antiamylolytic activity and were, in fact, considerably more active with regard to the former.

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[1] D. E. Bowman, *Proc. Soc. Exp. Biol. and Med.*, 57: 139, 1944.

ON THE FORMATION OF ACETYLCHOLINE IN THE NERVE AXON

IN our recent paper published under this title in SCIENCE (Vol. 102, p. 250) an error occurred in the figures of the table. The correct figures for the amounts of acetylcholine formed per gram and hour in normal (n) and degenerated (d) sciatic nerve are: 48 hours after section of the sciatic in one experiment, 53.0 (n) and 51.0 (d); in a second 41.0 (n) and 33.0 (d); 72 hours after section in one experiment, 51.0 (n) and 29.0 (d), in another 52.0 (n) and 17.0 (d).

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SCIENTIFIC BOOKS

OPTICAL ENGINEERING

Fundamentals of Optical Engineering. By DONALD H. JACOBS. 487 pp. 343 illustrations. McGraw-Hill Book Company. 1943. $5.00.

THIS text was prepared for use in the training of technical personnel for optical development and manufacturing. The treatment is an elementary one throughout, and no attempt at mathematical derivation is made. The mathematical knowledge required is limited to elementary trigonometry and algebra. Problems and bibliography are included for each chapter, and there is a complete index; drawings and photographs are clear and well reproduced. Such a book was needed in this country, and Dr. Jacobs's text has undoubtedly proven useful; a fourth printing recently appeared. The literature on optical instruments and design is quite limited in this country—nothing comparable to Merté, Richter and von Rohr, Conrady or Twyman has been published on American practices. The principles and methods of lens design are not general subjects in engineering schools, and optical instruction has lagged behind that in other branches of modern technology.

The construction of an optical instrument involves lens design, mounting design and production techniques in both optical and mechanical shops. A useful text must therefore combine a theoretical with a practical approach; Dr. Jacobs treats the optical aspects quite thoroughly. Subject headings include: the fundamental properties of lenses, stops and prisms; the photometric properties of images; low-reflectance coats; optical glass and its defects. Within military security regulations he discusses the functioning of the optical and mechanical elements of military telescopes, periscopes, gunsights and range finders. There is also a description and classification of standard camera objectives, which includes some data on the useful field and speed of commercially available types. The section on mechanical design is less systematic. There is an elementary description of machine shop operations with notes on bearings, gears, electric motors and photoelectric cells. No description of the principles of the operation of optical grinding, generating or polishing machinery is included, although these are peculiar to the optical industry, and no modern book on standard techniques in this country is available. It is to be hoped that a future edition might be expanded to include optical working and testing processes for lenses and flats.

The sections on the properties of lenses and on the actual methods used in the design of optical systems are naturally the most valuable, as well as the most difficult for the student. The process of ray tracing is described fully, with check computation methods, although no formulae are given for sagittal or skew rays. Tracing rays is a laborious and time-consuming

process; trial-and-error methods are inefficient in lens design. Dr. Jacobs uses the methods of theoretical computation of the aberrations, surface by surface, described by Conrady, whose notation he also adopts. The possible usefulness of the method involving the aberrations of the lens as a whole might be stressed. The notation and formulae given, for example, by Gardner in "Scientific Papers of the Bureau of Standards, No. 550," are excellent and give a deeper insight into the properties of complex systems; furthermore they permit the isolation of trial solutions quickly. A further possible criticism may be directed against the suggested computation of longitudinal aberrations; in camera lenses the lateral aberration on the focal plane is of practical importance while in telescopic systems the angular aberration is the most useful quantity.

The ideas involved and the general approach to a lens-design problem, together with the differential correction of a preliminary design, are treated in some detail. The student should obtain sufficient insight to design aplanatic objectives, standard eyepieces and simple telescopes. The final chapter discusses optical tolerances and gives methods for estimating quantitatively the permissible aberrations in a lens system. The text will undoubtedly prove useful to physicists as well as to technologists and helps to fill a gap in the literature on modern optics.

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SEROLOGICAL REACTIONS

The Specificity of Serological Reactions. By KARL LANDSTEINER, M.D. Revised edition. Cambridge 38, Mass.: Harvard University Press. $5.00.

WHEN the reviewer compares the first with the revised edition of this work, he is impressed with the extent to which the author has gone in rewriting and extending the discussions of the material comprising the first edition as well as his success in bringing each subject up to date as of 1944. The first edition contained 178 pages, including the index, as compared with 310 pages in the revised edition. The increased number of pages is due in part to the addition of new material throughout the book and the development of two new chapters, one of 35 pages entitled "Antigen-Antibody Reactions" and the second of 19 pages entitled "Molecular Structure and Intermolecular Forces." In all there are eight chapters in the revised edition.

In the previous edition the first chapter contained only a brief discussion of antibodies and of "specificity" as related to serological reactions. This has been extended to include a discussion of the "Principal Immunological Phenomena and Nomenclature." The reader is supplied with simple definitions of various immunological terms. Reference is also made to methods of immunization and to the significant steps that have occurred in the development of immunology.

The second chapter is entitled "The Serological Specificity of Proteins" and has been enlarged from 34 to 62 pages. The author has expanded his discussion of the work of Dean and Webb on optimal proportions and of Heidelberger and Kendall's work on estimation of the amount of antibody in serum by nitrogen analysis. In both the first and the revised edition the author speaks of the rabbit as being a rodent. This concept leads him to say that "from this it may be understood why rabbit immune sera are very useful for revealing dissimilarities in the proteins of other rodents, . . ." This is rather surprising since the zoologists have for many years classified rabbits as belonging to an entirely different order called Lagomorpha.

Further on in this chapter he discusses some of the newer factors determining specificity and says that "one can not safely offer an opinion concerning the specific groups of protein (determinants) as long as it is not known what the maximal size of such a determinant can be." The author seems to feel that the view advanced by Obermayer and Pick that aromatic groups have prominent significance is probably incorrect. He feels, however, that one can not flatly deny that aromatic groups may be of greater importance than others for the specificity of protein reactions.

Chapter 3 is entitled "Cell Antigens," and in size has been increased by nine pages. The author stresses in both editions the two kinds of specificity—the one observed in proteins and the other observed in cells. He has added numerous references to his discussion of heterophile antigens and their behavior as well as to the specificity of the Wassermann reaction, and suggests the inadvisability of the use of the term "antigen" in reference to the use of the Wassermann substance. He also adds a section of new material entitled "Antigenicity of Phosphatides, Sterols, Starch, et cetera."

The title of Chapter 4 has been changed from "The Specificity of Antibodies" to "The Nature and Specificity of Antibodies" in the revised edition. The chapter has been expanded from 14 to 20 pages. The first two pages of the chapter are largely rewritten. He has added a discussion of the work of Kidd and Friedewald and of Durham-Reynolds on natural antibodies, especially those acting upon material derived from the same individual and other members of the same species. The section on immune antibodies is completely rewritten. The subject is discussed under