of dictionaries, like the best of other compilations, are those that have been subjected to rigorous criticism, biologists will be performing a service to students and writers by giving Dr. Knight the benefit of their ideas.

Twelve pages of appendices constitute a valuable feature of the book. These include numerous commonly used statistical formulae and tables, among them a table of chi square that is more extensive than similar tables in most text books. There is an unusual table of "Distances Recommended to Avoid Seed Contamination," compiled from the recent literature. The book is attractively made up and is printed on a heavy grade of paper in clear and legible type.

EDWARD C. COLIN

Chicago Teachers College

General cytology. E. D. P. DeRobertis, W. W. Nowinski, and Francisco A. Saez. (Trans. by Warren Andrew.) Philadelphia: W. B. Saunders, 1948. Pp. 345. (Illustrated.) $5.50.

This readable and well-illustrated short text, originally published in Argentina, achieves a remarkably broad survey of modern cytochemistry, cell physiology, and cytogenetics. Its emphasis on cytoplasmic structure and the activities of "resting" cells reflects the profound shift in interest in the 25 years since Wilson's summary of classical cytology, with its concentration on chromosomes in dividing cells. Noteworthy features are accounts, previously reviewed only in symposia and monographs, of recent work on secretion, chromosome structure, "ultrastructure," membane permeability and enzyme systems, and descriptions of many ingenious techniques of physical and chemical cytology (occasionally emphasized at the expense of results or interpretations). In the reviewer's opinion, however, the book's principal contribution is pedagogical: The presentation of cytology as the synthesis of related facts customarily scattered through courses in "cytology," histology, physiology, biochemistry, genetics, and embryology. That the unity actually achieved is far less than ideal is no argument against either the validity of the innovation or the need for such a course at the senior or beginning graduate level. Rather, it is a challenging commentary on our state of knowledge.

The book is reasonably free from the twin curses of cytology: excessive and esoteric terminology, and "explanation" by definition or redescription. Each chapter has an up-to-date though incomplete bibliography. The emphasis is more zoological than botanical. The translation is clear, if not always polished. Occasional prominence given the authors' own work reflects their enthusiasm and directs attention to research in Latin America. Critical readers will note: a fair number of minor errors; omission of some pertinent modern contributions, for example, in the experimental analyses of cell division and of radiation effects; acceptance of some recent work with less reservation than perspective may justify; hypocritical embrace of certain Darlingtonian hypotheses; and inclusion of much primarily genetical material. However, such defects are remediable by a good teacher, and do not obscure the wealth of well-considered and accurate information presented. Few will agree that "Purely morphological cytology . . . has exhausted the study and description of various cellular structures," but also few will deny that here a stimulating step is taken toward the integration of biological, physical, and chemical data which must ultimately give us a unified and meaningful concept of the structure and functioning of the living cell.

JOHN B. BUCK

National Institutes of Health

Nucleic acids and nucleoproteins. (Cold Spring Harbor Symposia on Quantitative Biology, Vol. XII.) Cold Spring Harbor, N. Y.: Biological Laboratory, 1947. Pp. xii + 279. (Illustrated.) $7.00.

This volume is the second symposium on nucleic acids to appear in print within a year (cf. *Symposia Soc. exp. Biol.* Vol. 1). This coincidence reflects the current wide interest in nucleic acids as an important cell constituent and a possible key to some of the fundamental problems of cellular biology. Although the contents of the two symposia overlap in part, the wealth of material and the fluid state of research in this field, as well as the absence of definitive conclusions, make duplication a rather desirable feature. The reviewed symposium, organized by M. Demerec, included contributors from Belgium, France, England, Sweden, and the U.S.A.—among them J. M. Gulland. The volume is dedicated to this distinguished biochemist, who lost his life a short time after the meeting.

The 25 separate articles can be grouped into five major sections. The first deals with problems of the chemical and physical constitution of nucleic acids (NA) and nucleoproteins (NP). The structure of NA as a polynucleotide is discussed by Gulland in the light of the results of careful titrations. Taylor, Greenstein, and Hollaender report the effect of X-rays on the state of polymerization of NA, and the effect of ionizing radiations on various preparations of nuclear material is investigated by Errera. Enzymatic degradation as a tool of constitution analysis of NA is described by Greenstein, Carter, and Chalkley; and by Schmidt, Cubiles, and Thannhauser. Michaelis deals with the interaction of NA with basic dyes, correlating the spectral properties of the dyes with their degree of polymerization. For various reasons the chemistry of histological reactions has been notoriously neglected, and it is encouraging to find that the same author who in 1902 wrote a textbook that was probably one of the first introductions to the chemistry of histological staining is returning to this field.

Another group of investigators is concerned with the distribution of NA and NP in cells and tissues. Besides his own findings, Davidson includes data of several other authors on the NA content of mammalian tissues and of tissue cultures. Schneider compares the NA content of liver, regenerating liver, and hepatoma, and extends the determinations to separated cell parts like mitochondria and nuclei. Remarkable progress seems to be taking place in elucidating the composition of the chromosome.

This is borne out in studies on isolated nuclear components by Mirsky, Pollister, and Ris, and in histochemical studies by Serra, Schultz, and Mazia, Daniel, Hayashi, and Yudowitch. The presence of the Stedmans at the symposium, and their discussion of nonhistone proteins in the chromosome, give hope that a long controversy is on its way toward resolution.

The role of NA and NP in the biology of bacteria is considered by Belozersky and by Chargaff. Boivin presents his results on the production of mutations in colon bacilli by specific desoxyribose-nucleic acids and proceeds to an interesting discussion concerning the purity of his preparations of NA. The effect of chemical mutagens on bacteria is discussed by Witkin.

The possible significance of NA and NP in the embryonic development of organisms receives consideration by Brachet and Thorell. These authors deal with the possible function of NP as organizer and the changes of NA content in differentiating tissues.

An important phase in the current investigation of NA and NP is their relation to virus reproduction and to the synthesis of proteins. This field is covered by Knight, Hydèn, S. S. Cohen, and Spiegelman and Kamen. The papers of the last three authors deserve attention because of their objections to an oversimplified interpretation of the relation of NA content to protein synthesis in cells.

This volume has been a valuable aid to the reviewer in the course of his research on related topics—by the stimulating comparisons suggested in its widely different approaches, by its critical discussions, its reference lists, and its index. The subject selected for discussion and the high standard of contributions make this symposium a worthy continuation of the series. One is inclined to keep the volume near at hand at the laboratory. Swimming in the swift waters of present research on nucleoproteins, one may regard this book as an anchored raft on which to catch one's breath and gain enough distance from the currents to set one's own course.

HEINZ HERRMANN

Yale University

Investigations of human requirements for B-complex vitamins. Max K. Horwitt, Erich Liebert, Oscar Kreisler, and Phyllis Wittman. Washington, D. C.: National Research Council, 1948. Pp. v + 106. (Illustrated.) $1.00.

Because it is costly and difficult to measure man's physiological needs with quantitative precision, few such measurements have been made. There are very few estimates of continuing needs through periods long enough to stabilize body storage at fixed levels. In the present study, which sets a record for length of observation, experimental subjects were kept under controlled conditions for three years.

Detailed studies are reported on 36 men, 21 of them old and 15 young, who were kept on diets containing graded amounts of thiamine and riboflavin. The results are not dramatic but they indicate that 400 micrograms of thiamine is below the minimal daily requirement of inactive men; that the aged are less resistant than the young to restriction of B vitamins, although their optimal requirements do not appear higher; that a restricted intake of thiamine tends to intensify neurologic and psychiatric symptoms of the mentally infirm, but that a very liberal provision of B vitamins has no observable therapeutic value. A metabolic load test is described which promises to be useful clinically in the diagnosis of thiamine deficiency. It comprises mild exercise after oral glucose and immediate determination of lactic and pyruvic acids in the blood.

In epitome, the book reveals a careful, sober study whose value lies as much in its negative as in its positive findings. It illustrates both the possibilities and the difficulties of using the patients of mental hospitals for practical studies in nutrition. The authors, their sponsors, and the authorities of the Elgin State Hospital are to be congratulated for thoroughness and patience in an investigation requiring a high level of cooperation on the part of staff and subjects.

R. R. WILLIAMS

Research Corporation, New York City

Experimental immunochemistry. Elvin A. Kabat and Manfred M. Mayer. Springfield, Ill.: Charles C. Thomas, 1948. Pp. xv + 567. (Illustrated.) $8.75.

This book fills a particular need long felt by many workers not privileged to mature in the laboratories in which the science of immunochemistry was being molded. Drs. Kabat and Mayer, as students of Professor Heidelberger, have been instrumental in the development of this subject. The present book contains, "for the first time, in one place, the scattered techniques which have been developed to fill the needs of immunochemical problems."

In the first part we have the methodology of the antigen-antibody reactions. Here the quantitative immunochemical principles and methods are very clearly expounded and illustrated so that the student can apply these principles by analyzing for himself some of the numerous tables and graphs that have been compiled from the voluminous source literature. The book also serves as a laboratory manual with its many detailed procedures. Hence, from this section alone the book is an excellent accompaniment to an advanced laboratory course in the subject. Part II gives various applications and uses of the quantitative methods, such as assaying serological reagents and using quantitative methods in studying problems of homogeneity and cross reaction. Part III gives instruction in the special methods ranging from Kjeldahl nitrogen and phosphorus estimations to the more specialized physical biochemistry methodolgy. Part IV is a compendium of what might be termed "immunochemical preparations," giving methods for preparing substances of altered specificities, such as phosphorylated proteins, serum proteins and their fractionation, and various types of bacterial antigens. An appendix deals with the usual problems of bleedings, animal injections, glassware calibration, buffers, spectrophotometry, etc.

Experimental immunochemistry should be, therefore, of considerable value to those who work in the basic fields of preparative biochemistry and microbial metabolism