facts about the causative agent, and diagnostic procedures are brought together.

Although the book was written by a number of specialists, there is excellent uniformity of approach and evenness of presentation. The material is up to date and the coverage adequate. Since this book has but a single rival in its field as a recent source of the material, it might receive strong recommendation on the basis of relative cost; however, on its own merits it can be enthusiastically suggested as a solid foundation for anyone desiring a well-balanced presentation of the subject. It most definitely fulfills the need of a book on this subject for the medical profession, mature and neophytic, and it will be extremely valuable for the developing specialist in viral and rickettsial science.

WILLIAM S. PRESTON

University of Michigan

Dictionary of genetics: including terms used in cytology, animal breeding and evolution. R. L. Knight. Waltham, Mass.: Chronica Botanica; New York: Stechert-Hafner, 1948. Pp. x + 183. $4.50.

As an extreme example of the difficulties met with by readers of the literature of genetics and cytology, Franz Schrader, in his book *Mitosis* (1944) lists 27 terms that have been used by writers in English for a single minute specialized region (*spindle-attachment, centromere, kinetochore,* etc.) of the chromosome. As he states, his list is not complete. All will agree with him that there is no point in keeping alive the many names that have been applied to this small object since its first description 50-odd years ago.

Knight refers to this structure in his preface, where he lists nine of the 27 terms, plus a new one. He apparently had not seen the book *Mitosis,* since Schrader's name does not appear in the bibliography. We must also agree with Knight when he says that genetic literature would be more readily understood if writers had, where possible, used an existing term instead of coining a new one, and when he expresses the hope that writers will not continue to coin new words where suitable terms already exist. Now we may ask, how does Knight as a lexicographer meet the problem of synonymy; in particular how does he handle the chromosome region just mentioned? Wilson, in his classical work *The cell in development and heredity* (1925) called it the *spindle-attachment* and got along with this one term: neither in his index nor in his glossary does he give any of its 27 synonyms.

Turning to the body of Knight's *Dictionary* for an answer, one finds *spindle-attachment* listed and defined. Checking the other nine terms listed in his preface we find four—*attachment constriction, centromere, insertion region,* and *kinetic constriction*—alphabetically listed and defined. The definitions are in almost the same words as for *spindle-attachment.* Cross references indicate that the author considers these five terms as synonyms. The remaining five of the nine terms are listed alphabetically, and after each the reader is referred for a definition to one of the four terms just mentioned.

Although such duplication of definitions is not a general feature of the book, conservation of space might justify printing the definition once and listing all known synonyms, followed in each case by a cross reference only.

One cannot avoid speculating as to what brought about the profuse growth of synonyms in this glaring instance, as well as in the literature of biology in general. The origin of new terms for old objects may be in part adaptive change: the new terms may express more truly than the old the real nature of the entities. The term *spindle-attachment,* as used by Wilson, was accurate and descriptive so far as it went. But during the past 25 years some progress has been made toward understanding the object, both structurally and physiologically. Cytologists now agree that it is more than the region of spindle fiber attachment. Rather, it is regarded as a differentiated chromosomal structure which plays a dynamic role in the movement of the chromosomes during mitosis; hence *kinetochore,* a term suggested by Moore and recommended and used by Sharp in his *Introduction to cytology* (1934) and his *Fundamentals of cytology* (1943) is more descriptive.

Perhaps another cause for the multiplicity of synonyms among English-speaking biologists is isolation. Geographical or psychological isolation may account for the preference of British cytologists for the term *centromere,* introduced by Darlington in 1936, although it is admitted that this term is in many cases not an accurate one so far as indicating the linear position of the structure in the chromosome is concerned. The centromere may reside at any point along a chromosome except the extreme end.

The minting of unnecessary terms probably results also from the relative indifference of some authors to the interests of their readers—not to mention the possibility of their own occasional conceit or vanity.

Knight's *Dictionary* is not limited to modern terms, because, as the author states, students still read and need to understand the older books. Including older terms will, he hopes, help to deter authors from putting new meanings on established words.

For some of the entries, definitions are taken directly or with slight changes from the works of others. In these cases the original authors' names are added. It is not apparent to the reviewer why the names of some authorities are followed by dates and others are not. References to the 125 authors cited are given in the bibliography. The *Dictionary* contains about 3,000 entries. Derivations of terms are not given; nor are pronunciations.

Recalling the aphorism of Dr. Johnson that "Every other author may aspire to praise: the lexicographer can only hope to escape reproach," it is inevitable that critics will take exception to some of the definitions as well as to certain omissions and inclusions. This is anticipated by the author in his request for additions and corrections for subsequent editions. In general the definitions strike the reviewer as clear and concise. Very few outright errors have been noted in a sampling of numerous pages. The reviewer intends to take the author seriously and send suggestions to him. Since the best

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.