the differential extinction and reproduction of populations is a process uncongenial to Williams's world view, and he attacks it with the same vigor that characterized his earlier book *Adaptation and Natural Selection* in 1966. But the situation has changed greatly since 1966. At that time there was an urgent need to rebut V. C. Wynne-Edwards's *Animal Dispersion in Relation to Social Behaviour*, a task Williams performed with distinction. In the past several years a real theory of interpopulation selection has begun to be forged, with both enriched premises and rigorous model building. This part of the subject Williams ignores. He is still convinced, on intuitive grounds and in apparent puritanical devotion to the principle of parsimony, that interpopulation selection cannot be important in nature. His guess may or may not prove right—organic evolution is *not* parsimonious. But that is really beside the point. The possibility of evolution by interpopulation selection must be fully explored with an open mind. Insofar as the new theory considers the results of counteraction between group and individual selection, it will produce complex, nonobvious results that constitute testable alternatives to the hypotheses of individual selection. My own intuitive feeling is that interpopulation selection is important in special cases, and that its investigation will make evolutionary biology a much more interesting and challenging discipline in the future. At the very least the subject must be systematically developed. To deny that much would be to misconstrue the true nature of theory and evidence.

These faults are nevertheless secondary to the important accomplishments of a really excellent book. *Sex and Evolution* ranks among the best general works on evolutionary biology in recent years. The author also deserves to be saluted for his sense of the real and important, his crystalline prose, and his frank and modest style. He correctly observes that "the contest of ideas on these fundamental problems has only just begun. History has afforded a rare opportunity to ardent participants and alert spectators in the years ahead." *Sex and Evolution* will serve as the invitation and the guide to this contest.

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Biochemistry of DNA

DNA Synthesis. ARTHUR KORNBERG. Freeman, San Francisco, 1974. x, 400 pp., illus. $18.

DNA Synthesis is a clearly written and interesting presentation of the subject as viewed through the eyes of the durable patriarch in the field. The format of the book makes it easily readable, and it is well illustrated. In addition, it includes numerous tables compiling data that were previously widely scattered. Examples are the tables comparing properties of *Escherichia coli* DNA polymerases I, II, and III and listing mechanisms of degradation by exonucleases and mechanisms of inhibition in replication and transcription. The book is written at such a level that it will be useful for researchers in DNA replication as well as for persons interested in supplementing their general biochemical knowledge of the subject.

The first two chapters of the book deal with the structure and function of DNA and the biosynthesis of DNA precursors. These chapters help make the book complete and perhaps will be useful to the novice, but the elementary presentation of this material seems out of step with the sophisticated presentation in the remaining chapters.

The next two chapters describe many aspects of the *E. coli* DNA polymerase I including isolation, types of reactions catalyzed, proteolytic cleavage, properties of the DNA product, and physiological role. The work embodied in this discussion represents a primary research interest of the Kornberg laboratory during the last ten years; hence most of the account tends to be complete in its detail and the material is logically and clearly presented. However, little emphasis is placed on the substantial contributions of the geneticists. Several years ago a variety of mutants of genes affecting DNA synthesis were characterized. Biochemical and genetic studies with these mutants have provided new insights into this complex process and promise to be even more revealing in the future.

The extensive documentation of the properties of the *E. coli* DNA polymerase is followed by two chapters giving a rather cursory account of bacterial, phage-induced, and eukaryotic cell DNA polymerases. Minimal coverage is given to DNA polymerase II and the alternate forms of polymerase III from *E. coli*, the polymerases from *Bacillus subtilis* and *Micrococcus luteus*, and the polymerases induced by T-even, T-odd, and *B. subtilis* phages. Likewise, eukaryotic cell DNA polymerases are covered only spottily despite the fact that they have been a subject of enormous research interest in the past several years. An example of the sparse coverage is the two-page treatment of terminal nucleotidyl transferase, an enzyme known for more than ten years and widely used in a variety of laboratories in several different contexts.

The chapter on the replication of DNA viruses is one of the most outstanding presentations in the book, in my judgment. It is based on the use of small, well-characterized DNA viruses as tools to study DNA replication events. The structure of the viruses, their mechanisms of infection and replication, and genetic studies are presented. The viruses include M13, ϕX174, T7, T4, λ, certain plasmids, and SV40 and polyoma. The easily readable comparison of the features of these viruses is unique to this book.

A chapter on RNA polymerase is included near the end of the book. The chapter provides a useful overview of the subject for the elementary reader; however, since many excellent and complete reviews on this subject exist, it adds little in the way of usefulness to researchers in the field. The last chapter of the book briefly cites some of the achievements of chemical and enzymatic synthesis of polynucleotides.

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Molecular Genetics

Gene Expression. BENJAMIN LEWIN. Two volumes. Vol. 1, Bacterial Genomes. xviii, 642 pp., illus. $29.50. Vol. 2, Eucaryotic Chromosomes. xvi, 468 pp., illus. $23.50. Wiley-Interscience, New York, 1974.

Benjamin Lewin has put together for the first time an advanced, comprehensive, and exacting account of our knowledge of gene expression in both prokaryotic and eukaryotic organisms. The presentation is well organized, documentation is extensive, and facts are separated from opinions. Of particular value are the large number of figures depicting current models of various aspects of gene expression. These two volumes should prove extremely useful

for graduate students and researchers in molecular biology and related fields.

Volume 1 begins with a rather perfunctory discussion of the genetic code and the synthesis of polypeptide chains. This is followed by two excellent chapters on structure-function relationships in the ribosome and transfer RNA. By this time the reader has gained an understanding of our present knowledge of protein synthesis and is prepared for the next section, on control.

In this section the initiation, elongation, and termination of RNA synthesis as deduced from transcription studies on phage genomes are presented. The section also contains discussions of the control mechanisms operating in the lactose, L-arabinose, galactose, and arginine systems in *Escherichia coli*. This reviewer questions the inclusion of all this material in a section on transcription because there had not been a rigorous demonstration of control at the transcriptional level in *ara* and *arg* when the book went to press. A good feature of this section is an excellent general discussion of positive and negative control in both inducible and repressible systems.

The final part of volume 1 describes the reproduction of DNA. Included are chapters on replication, modification, repair, recombination, and the cell division cycle.

Volume 2 is divided into two sections dealing respectively with the structure of the eukaryotic genetic apparatus and with the expression of eukaryotic genes. The first chapter reviews the evidence for the continuity and semiconservative replication of DNA in the chromosome. The organization of chromatin fibers is discussed in terms of the folded-fiber model. The molecular events associated with the cell division cycle are related to the classical descriptions of these events. Two chapters are devoted to the protein components of the chromosome and sequences of DNA. The large amount of work on sequence analysis and modification of histone proteins is reviewed. A final section discusses the structure of chromatin. The chapter on DNA sequences contains a fine summary of hybridization studies, analyzing important procedures and pointing out the pitfalls and limitations of this type of work. A section on the organization of heterochromatin discusses possible mechanisms of band formation.

The complexity of the eukaryotic genetic apparatus is evident from the material presented in the second part of the volume. A chapter on transcription and processing of RNA begins with a detailed analysis of the methods used to characterize RNA sequences. The processing of heterogeneous nuclear RNA and 45*S* precursor RNA is discussed. A chapter on control of transcription describes eukaryotic RNA polymerases and presents some of the models for control of gene expression. The final chapter discusses nuclei transplantation experiments and somatic cell hybridization studies. The use of cell fusion for studies of nuclear gene expression and genetic mapping is illustrated.

In general the author is careful to define terms and to qualify statements on matters that may still be controversial. An excellent selection of photographs is an added feature of this volume.

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Carbon-13 Spectroscopy

Topics in Carbon-13 NMR Spectroscopy. Vol. 1. GEORGE C. LEVY, Ed. Wiley-Interscience, New York, 1974. xii, 292 pp., illus. $17.50.

The authors of each of the six chapters in this book present solid introductions illustrated with examples drawn largely from their own work. For the first volume in a series on carbon-13 NMR (nuclear magnetic resonance) spectroscopy, chemical shifts and relaxation are obvious topics. Theoretical calculations of shifts are treated by R. Ditchfield and P. D. Ellis, and an empirical approach to them is presented by G. Maciel. For the chemist who wants to utilize carbon-13 as a structural tool, Maciel's ideas will prove valuable. Ditchfield and Ellis, taking a more rigorous approach, succeed in both presenting several theoretical treatments and in delineating the experimental facts, which they have treated most satisfactorily.

Spin relaxation is presented by J. R. Lyerla and G. C. Levy. The theory of mechanisms is covered extensively and illustrated with numerous examples. For the beginner in carbon-13 research this chapter can serve as a thorough introduction to experimental problems. It also serves as an introduction to the more specialized chapters of the book. From Jacob Schaefer's chapter it is clear that both shifts and spin relaxation parameters are valuable in the study of polymers. F. A. L. Anet relies heavily on the spin relaxation chapter in his discussion of high field systems. The organic chemist who will use carbon-13 as an analytical tool will find J. Stothers's chapter most valuable. Stothers has extended a section of his earlier monograph and presents examples of both carbon-13 and deuterium tracer studies.

The authors have succeeded in their objective, which is to sell carbon-13 NMR spectroscopy as a technique. Some of the chapter introductions are similar to those found in other collections on magnetic resonance. Where this occurs, however, direct applications to carbon-13 are also presented, and it is convenient to have the introductory material at hand. All six chapters present enough experimental data to make the significance of their topics obvious. The book is significantly different from other monographs on this subject. For those who are already experienced in proton magnetic resonance applications, this volume can aid in gaining an understanding of carbon-13 spectroscopy.

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Disordered Materials

Amorphous and Liquid Semiconductors. J. TAUC, Ed. Plenum, New York, 1974. x, 442 pp., illus. $28.

By now, most scientists are aware that the electronic properties of disordered materials are at least as diverse as those of crystalline solids and that amorphous solids and liquids can be insulators, semiconductors, or metals. Nevertheless, there has been little effort to rewrite the texts and modify the courses in solid state theory to avoid misleading students and novices about the importance of periodicity. It is even difficult to find specialized texts that adequately cover amorphous and liquid materials; apart from the book by Mott and Davis, currently being revised, there are only several recent conference proceedings and one monograph. One reason for this lack is the rapid progress that has taken place over the past decade, spurred