equations are then used in a discussion of block replacement, replacement based on age, and random replacement. Next, optimum replacement policies subject to cost and availability constraints are analyzed, with special reference to dynamic programming procedures when these procedures are applicable. In the chapter concerned with stochastic models, the authors consider repair problems and optimal maintenance policies when the deterioration law of the system is assumed to be Markovian or semi-Markovian.

Chapter 6 is concerned with postulating models that give the amount of redundancy (both parallel and standby) necessary to maximize the probability of system survival subject to various constraints. Finally, monotonic (coherent) structures are discussed with special emphasis on k out of n structures. Bounds are given for structure reliability. Also, a generalized version of the Moore-Shannon inequality is employed to obtain the number of components needed to achieve a specified reliability.

In conclusion, it seems that this book will be a worthwhile addition to the libraries of probabilists and mathematicians working in the area of reliability analysis; however, owing to its theoretical nature and because adequate examples are not provided in some cases, it is doubtful whether the practicing reliability engineer will find it of much value.

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An Encyclopedic Survey

Structure of Matter. Wolfgang Finkelnburg. Translated from the 9th/10th German edition (1964) by the author and Ottilie Matossi-Riechemeier. Springer, Berlin; Academic Press, New York, 1964. xii + 511 pp. Illus. $14.50.

This book covers a huge range of material with a competence that is almost frightening. There are seven basic sections: Introduction; Atoms, Ions, Electrons, Atomic Nuclei, Photons; Atomic Spectra and Atomic Structure; Quantum Mechanics; Physics of Atomic Nuclei and Elementary Particles; Molecular Physics; and Solid-State Physics from the Atomistic Point of View. The last section, for example, is roughly equal in word count to some of the smaller books on the subject, such as Wannier's *Elements of Solid State Theory*.

Structure of Matter has the format of a textbook and it is, according to the preface, "written for students of physics, chemistry, biology, and engineering, in fact for all who wish to keep abreast with the rapid progress being made in this important field." The idea of a student of biology "keeping up" with the Gell-Mann theory of elementary particles, the developments in connection with controlled fusion, the shell model and collective model of the nucleus, the wave-mechanical theory of radiation, and a host of similar topics seems all too much like a dream (or a nightmare?). Accordingly, it appears to me that the major value of the book is not as a textbook, but rather as a kind of "low-brow reference book." To put it simply, there are very few (if any) subjects covered here which are not better covered somewhere else, so the value of the book is in the package deal that it offers.

The first edition of Finkelnburg's *Einführung in die Atomphysik* appeared in 1948, the present work being a translation from the 9th/10th German edition. It is amazingly up-to-date in its descriptive sections which are, by their nature, easy to update—for example, the table "Presently Known Elementary Particles" proudly lists the Ω^-. But the authoritarian spirit that allows the author, on page 335, to quote an equation without any explanation (much as $E = mc^2$ might appear in the New York *Times*) does not lend itself to exposition of matters where understanding is more important than facts. One may perhaps forgive the refusal to use the notation $\hbar$ instead of cluttering the equations with factors of 2π; that is symbolic more than symptomatic of the approach. What is less forgivable is the old-fashioned introduction of quantum mechanics as an improvement of the old Bohr-Sommerfeld theory, accompanied by fanfares about gamma-ray microscopes, thought experiments, and the uncertainty principle. The present generation of physicists knows that the essence of quantum mechanics, in the sense of superposition of probability amplitudes, is not complicated and, incidentally, has nothing to do with partial differential equations. What *is* complicated is the connection between quantum mechanics and classical mechanics. Because classical mechanics was known earlier, it is understandable that the historical development had to go through that very difficult path, but there is no reason for an introductory treatment to become deeply involved with it. Along similar lines, the section "Achievements, Limitations, and Philosophical Significance of Quantum Mechanics" is ponderous and not particularly useful. Quantum mechanics is something one does not so much *learn* as *get used to*—a fact which should not be hidden behind contrived attempts to make it look reasonable.

It remains true that some shortcomings of the sort encountered in this book are virtually inevitable when one considers the huge compass of material covered. Rather, it is impressive that such an encyclopedic work is, unlike most encyclopedias, apparently quite free of factual errors.

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Organic Analysis

Qualitative Organic Microanalysis: Cognition and Recognition of Carbon Compounds. Frank L. Schneider. Academic Press, New York; Springer, Vienna, 1964. xii + 535 pp. Illus. $22.50.

This book is a classical approach to qualitative organic analysis. Chapter 1 deals with fundamental apparatus and operations. The second chapter is devoted to preparation of the sample, including separation methods. This chapter gives an excellent description of apparatus and techniques for such microscale operations as distillation, recrystallization, and extraction. Techniques like liquid chromatography and ion exchange are included, but thin-layer chromatography and gas chromatography are not mentioned. The next three chapters are concerned with preliminary examination and include elementary analysis, determination of physical constants, and solubility.

The rest of the book is devoted to systematic analysis, much like that used by Shriner and Fuson and available in other texts. However, the inclusion of many quantitative methods for various functional groups is a distinct improvement over previous books on identification of organic compounds. Many quantitative, functional, group methods are simple to carry out, and they provide information that is