locus" and "that each chromomere is really a single gene," that genes and most centromeres are not subdivisible, and so on for many of the cardinal issues of chromosome cytology and genetics. Use of *probably,* where *possibly* or *perhaps* is more clearly in order, and other persuasive verbalisms, tend to impart an enormously favorable slant to the expression of White's views. Any who are concerned with specific conclusions or evaluations will do well to study the original papers.

Since stress is given to what is regarded as cytogenetic interpretations, it should be commented that *cytogenetic* has here a different connotation than usual. White generally and necessarily deals with cytology that is accompanied by an *ad hoc* and consistent genetic interpretation rather than cytology that is tested or corroborated by direct genetic data or experiment. As is so often the case in the writings of our modern evolutionists, natural selection as a cause is deduced from effect, and the resulting arguments and conclusions are, of course, unconvincing.

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Life on Other Worlds. Harold Spencer Jones. English Universities Press, London, rev. ed. 2, 1954. xi + 259 pp. Plates. $3. (U.S. distrib., Macmillan, New York.)

In this little book, Harold Spencer Jones summarizes in a lucid way the knowledge pertinent to this fascinating question. The first chapter presents a summary of our present ideas on the structure of the universe. Then comes a discussion of conditions necessary for life. This is largely concerned with the unique chemistry of the carbon compounds. The author next describes the available methods of investigation, including the theory of escape of atmospheres, spectrographic analysis of planetary atmospheres, and means of determining planetary temperatures. After a discussion of the probable evolution of the atmospheres of Earth, he considers worlds without atmospheres and then, at the other extreme, the giant planets. Separate chapters are devoted to Venus and to Mars. Finally, theories of the origin of the solar system are considered. A concluding chapter points out the implications of the evidence developed.

This book is obviously written for the intelligent amateur and for scientists other than astronomers who wish an authentic summary of the information bearing on this topic. Quite naturally, therefore, the professional astronomer will find little with which he is not already familiar. However, the clarity of style and the skill with which concepts are completely and concisely developed make this book one that can be read with profit by anyone engaged in teaching an introductory course in astronomy, and it can provide valuable collateral reading for students in such courses. Inevitably, a book last revised in 1951 is out of date in certain details, but the nature of the treatment is such that this in no way vitiates the general theme.

In general, this book succeeds admirably in its purpose of presenting a summary of the solid scientific information bearing on the ever tantalizing question of whether life exists on worlds other than this.

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Quantum Mechanics. P. Mandl. Academic Press, New York; Butterworths, London, 1954. viii + 233 pp. Illus. $5.80.

The field of quantum mechanics is already blessed with a number of excellent textbooks. Nevertheless, F. Mandl's book is a welcome addition to this list. Apart from elementary "first courses" on wave mechanics and from specialized treatises on specific applications of quantum theory, most previous textbooks fall in two classes. The first group contains very readable books concentrating on the underlying physical principles and the practical use of quantum mechanics, such as the American textbooks by Bohm and by Schiff. The second group concentrates on the rigorous mathematical foundations of quantum mechanics, for example, the classic works by Dirac and by von Neumann. These works, although important original contributions, are by no means easy reading for the theoretical student and experimental physicist. Mandl's book is also designed to bring out the unifying mathematical scheme underlying quantum mechanics. It deals with the more formal aspects of the theory but without undue stress on rigor and without assuming any elaborate mathematical training on the part of the reader. Only the nonrelativistic theory is treated throughout.

In the first five chapters the mathematical formalism of quantum mechanics is developed in detail, with particular attention to its physical interpretation rather than to practical applications. After a chapter on mathematical techniques, the concepts of wave mechanics in general and eigenfunctions in particular are introduced. A thorough and clear treatment of matrix mechanics and of the general operator formalism follows. Especially welcome is a discussion of the measurability of operators and related questions of observation.

The remaining four chapters deal with specific applications, but from a point of view somewhat different from that of most previous books on a comparable level. The main aim of these sections is to illustrate the use of the general theory, rather than to obtain theoretical results in various branches of physics. Included are treatments of angular momentum operators and their application to systems of many particles, of the perturbation method, and of collision theory. The book ends with a discussion of group-theoretic methods. This discussion is noteworthy for its simplicity, not usually found in treatments of group theory. The book's usefulness is enhanced by a collection of exercises, together with hints for their solution.

Quantum Mechanics probably should not be considered as a textbook for the more standard courses

on quantum mechanics taught at American universities, with their emphasis on the practical aspects of the theory. In fact many standard topics (such as details of the wave functions of the hydrogen atom and phase-shift analysis in scattering theory) are hardly treated at all and the reader is referred to books such as the one by Schiff. But Mandl's book will be very useful to anyone who wants a simple, but systematic and self-contained, exposition of the formal aspects of quantum mechanics and of the mathematical techniques used in its application.

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Characteristics and Applications of Resistance Strain Gages. Proceedings of NBS symposium held 8–9 Nov. 1951. National Bureau of Standards, Washington, D.C., 1954. iv + 140 pp. Illus. $1.50. (Order from Supt. of Documents, GPO, Washington 25, D.C.).

As of the date of the symposium, these papers consisted of the latest experimental results with respect to resistance strain gages and the latest attendant theoretical considerations. They were contributed, not only by leading experts in the United States, but by such well-known foreign personalities as R. G. Boiten of Delft, Holland, G. V. A. Gustafsson of Ulvsunda, Sweden, and A. U. Huggenberger of Zurich, Switzerland.

The papers cover a variety of topics and include the application of strain gages to measurement of mechanical quantities (acceleration, impact forces, and dynamic pressure), as sensing elements in the field of instrumentation, and to determination of the strain in concrete by imbedding techniques. Also, as of the date of the symposium, new work in progress is reported, including such applications as strain sensitivity in conducting coatings and strain gages in commercial weighing.

A valuable part of the book is the inclusion of discussions that followed presentation of the papers.

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Physical Chemistry. Based on *Physische Scheikunde.* A. J. Rutgers. Interscience, New York–London, 1st Eng. ed., 1954. ix + 804 pp. Illus. $8.50.

The thoroughness of Rutgers' treatment of the fundamental principles of physical chemistry is indicated in part by the inclusion of a chapter on classical theoretical mechanics, in which the importance of the phase integrals is pointed out before the introduction of Bohr's quantum postulates and the development of wave mechanics. The chapters on thermodynamics also exhibit a high standard of pedagogy (although, in the discussion of temperature scales, the identity of the thermodynamic and ideal gas scales is not recognized).

In an attempt at completeness, a chapter on the physical chemistry of high polymers, written by Turner Alfrey, has been appended. Nevertheless, a number of important topics have been treated either very briefly or not at all. For example, little space is devoted to quantum mechanical valence theory. In the chapter on the Einstein and Debye theories of the specific heats of crystals, no mention is made of the computations of frequency distributions in crystals by Blackman and others. No reference is made to Hildebrand's treatment of regular solutions or to extensions of the Debye-Huckel theory of strong electrolytes.

In spite of these and other omissions, the meticulous presentation of the topics covered should prove valuable to any student of physical chemistry. The translation, although generally good, is awkward in places. The recurring phrase "we follow" for "it follows that" in some of the derivations should certainly have been corrected before publication. There are a number of typographical errors, but these should not cause any misunderstanding of the text.

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Highway Engineering. Laurence I. Hewes and Clarkson H. Oglesby. Wiley, New York; Chapman & Hall, London, 1954. xi + 628 pp. Illus. $8.

This volume is an excellent, comprehensive book intended for a textbook in highway engineering. In this respect it is entirely satisfactory. The junior or senior engineering student being introduced to highway engineering for the first time will find it completely comprehensible. The ambiguous and often confusing verbiage found in technical engineering books is conspicuous by its absence here; hence, the subject matter is presented clearly and simply without the necessity of long interpretations.

Although the volume is long for presentation in a one-year course it is so written that it may readily be adapted as such. It is ultramodern and completely up to date with the latest features of current superhighway design and construction included.

The documentation of the materials in the book is complete with references to source matter indicated at the bottom of the page, close to the text. Tables, charts, and diagrams are used profusely and are invariably clear, simple, and easy to follow and interpret.

The book approaches the details of design and construction after an orderly introduction to highway systems, planning, economy, finance, and other fundamental chapters. Those on highway economy and finance are particularly excellent. Many of the chapters have contributions by various members of the U.S. Bureau of Public Roads. The effect of these and other collaborators has been to eliminate prejudice and regional emphasis.

The practicing highway engineer will find it a valuable investment of his time to review this book and its systematic development of current practice. It will not only prove to be a "refresher" course but should