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

provoke profound interest. The soils and geological engineers too will find many worth-while chapters affording a stimulating and instructive background to their own specialties in relationship to highway work. The layman and the legislator alike would profit by an examination of the book and gain thereby an appreciation of the problems involved in highway construction and the great progress made, especially in the past 35 years.

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***Clinical Aspects of the Autonomic Nervous System.*** L. A. Gillilan. Little, Brown, Boston. xii + 316 pp. Illus. $6.50.

This book is intended to furnish a summary of the knowledge of the anatomy and physiology of the autonomic nervous system as a background for clinical practice. This purpose is not achieved, because, whereas the anatomical summary is adequate, particularly with regard to gross anatomy, the physiological data and theories are presented incompletely, deficiently, and often erroneously.

As examples of these errors I mention the statement (p. 161) that "certain tissue products such as acetylcholine and histamine . . . produce generalized vasodilation of coronary and peripheral vessels," coupled with the further statement that "epinephrine and ephedrine are peripheral vasoconstrictors and coronary vasodilators." Although the chemical mediation of coronary vasodilators and constrictors has not been unanimously settled, there is unanimous agreement that either acetylcholine or adrenaline leads to constriction. As another example I quote the statement (pp. 20–21) that "it is believed that mass release of acetylcholine at the myoneural junction brings about generalized contraction of the voluntary musculature." High concentrations of acetylcholine lead to paralysis, not to contractions.

In the classification of autonomic disturbances and body types, the author accepts the now generally discarded criterions of Eppinger and Hess, of Danielopolu, and of Martinet (not quoted in the bibliography) of sympathicotonia, amphotonia, and vagotonia. I fail to find "a striking parellelism" between this classification and all the others grouped in Table 1.

A salient flaw in the book is a striking negligence to give appropriate credit to many investigators and the giving of undue credit to others. Thus, I disagree with the assertion that "the autonomic nervous system got its first firm footing in medicine when Peet (1935) devised his operation for relief of hypertension." The basis of our knowledge of the chemical transmission of nerve impulses is Loewi's study of the heart, not Dale's work on acetylcholine. The generally accepted theory of hunger was proved by Cannon and Washburn (1912), not by Carlson. The role of the sympatho-adrenal system in emotions was not an "obvious" anonymous contribution (p. 84); it was first emphasized and later beautifully analyzed by Cannon.

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***Rural Electrification.*** vols. I and II. United Nations Economic and Social Council, Geneva, Switz., 1954. vol. I, ii + 163 pp. + tables. Plates. Paper, $1.50. vol. II, ii + 165 pp. Plates. Paper, $1.25. (U.S. distrib.: Columbia Univ. Press, New York.)

This two-volume work, representing the collective rural electrification experience of 14 nations, is an excellent compendium of modern knowledge in this specialized field. The material is admirably organized to accomplish its avowed purposes of (i) making available to relatively less industrialized nations the special techniques that have proved successful in bringing central station electric service to farms throughout the world, and (ii) providing nations already advanced in rural electrification with a means of measuring their own techniques and progress against the achievements of the rest of the world. In addition, a diversified pool of knowledge is made available for the benefit of all nations.

The material is not limited to discussions of broad principles. Its value is not curtailed by any attempt to avoid technical terminology or mathematical analysis where these are applicable. The volumes are well worth study by any agency responsible for initiating, redeveloping, or expanding a national or regional rural electrification program. Volume I provides specific details on proved principles of design applicable to network planning, rural distribution facilities, and small local thermal and hydroelectric generating stations. There is also considerable specific data covering experience with respect to cost and rate structure design.

The early rural electric system design engineers pioneered new construction standards and techniques in order to reduce line construction costs to a point where the relatively sparsely settled rural areas could be economically served. In this endeavor, mistakes were, of course, made in both electrical and mechanical construction practices. These mistakes effectively increased the cost of original facilities in many instances. Present-day higher price levels make it almost mandatory that these early mistakes not be repeated, and a careful review of the comprehensive experience of 14 nations well established in the technology will be of great advantage to present designers in striking an optimum balance between low initial costs on one hand and reasonable maintenance charges and flexibility for growth on the other.

One of the very few faults of the work is the absence of an index and a consequent inability to locate material on specific topics without excessive thumbing. This lack is somewhat compensated for in volume II by the inclusion of a table of contents with chap-