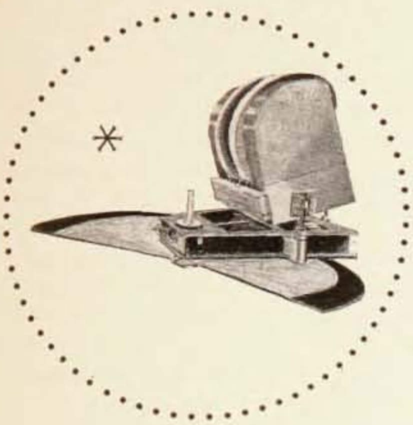
trying to learn field theory. However, the latter can profit from the novel emphasis of Bogoliubov and Shirkov, which differs from that employed in most texts on quantum field theory.

In their introduction the authors give an excellent historical perspective of the development of modern quantum field theory. Early in the text they introduce covariant-contravariant four-dimensional notation and review the classical theory of fields, spinor algebra, the Dirac equation, and transformation theory. Among the applications, they discuss scalar, vector, and electromagnetic fields. They postulate the quantum conditions by means of the correspondence principle, and introduce the regularization of Pauli and Villars rather than compensating fields or cut-offs. Improper integrals and limiting sequences are carefully defined. In their treatment of the scattering matrix they prefer a method first introduced by Stueckelberg (which does not refer to the Hamiltonian or the Schrödinger equation) to the customary expansion of the Hamiltonian in the interaction representation. The authors almost immediately introduce the Bogoliubov form of the causality condition, which makes use of adiabatic switching on and off operators. The S-matrix is then developed in an expansion by means of the principles of relativistic invariance, unitarity, and causality. The connection to the more usual methods (e.g., Feynman diagrams) is made. In the removal of divergences mathematical analysis is emphasized, and applications through the third order in perturbation theory are given as examples. The classic examples of electrodynamics, e.g., vacuum polarization, anomalous magnetic moment, and the Lamb shift are also found in this text. Before coming to grips with dispersion relations, the authors finally discuss state functions, the method of functional averaging, and the renormalization group. In the chapter on dispersion relations the authors review the development up to two years ago and use the method of Bogoliubov to discuss both forward and nonforward dispersion theory for pion-nucleon scattering.

The presentation is thorough throughout. This reviewer found that the stress on mathematical rigor detracted from the orderly development, and hence from the understanding to be derived from a study of the text. However, for the nonneophyte in field theory, it offers a broadened scope through novel treatment. The authors thoughtfully relate their approach to the more classical one.

Theory of Unimolecular Reactions. By Noel B. Slater. 230 pp. Cornell U. Press, Ithaca, N. Y., 1959. \$4.75. *Reviewed by Stuart A. Rice, Institute for the Study of Metals, The University of Chicago.*

BECAUSE of their intrinsic simplicity, unimolecular reactions have long been a favorite subject of study by theoretical chemists. In this short book based upon a series of lectures, N. B. Slater has presented a detailed description of his own contributions to the field. Although there is some new material, the book



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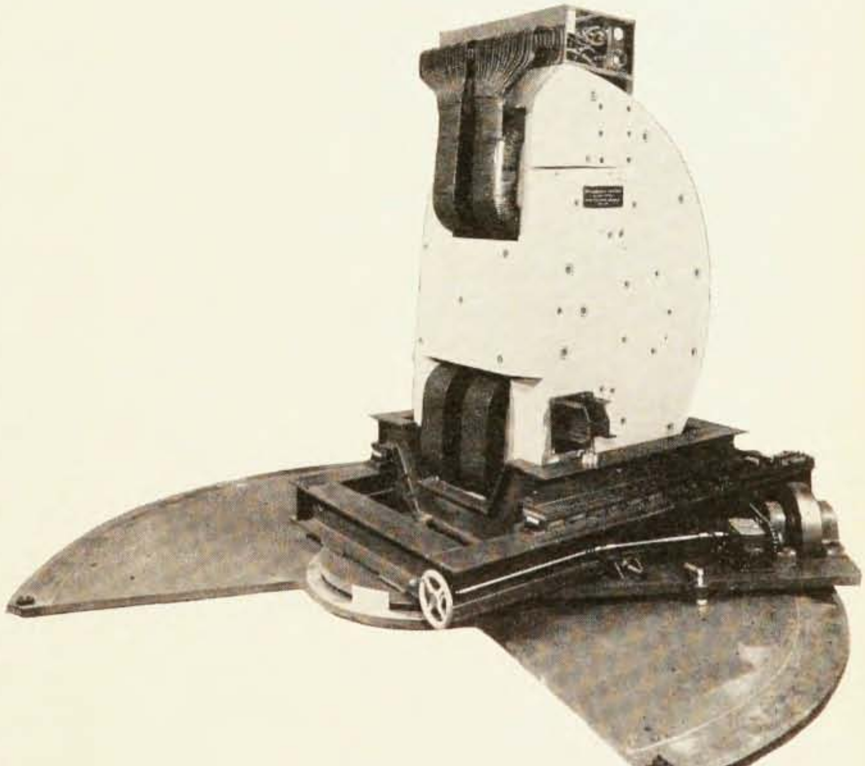

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932 American Street • San Carlos, California • Telephone LYtell 1-4524 is largely a collection and systematic presentation of work scattered rather widely through the current literature.

Briefly, the Slater theory attempts to describe the decomposition (or isomerization) of a molecule in terms of the normal modes of the parent molecule and their superpositions along specified directions. It is a successful molecular picture in that no ambiguous concepts are introduced and every parameter descriptive of the reaction rate is uniquely defined in terms of the normal modes of the parent molecule. There are, of course, many difficulties in the theory (i.e., the role of energy transfer between modes due to anharmonicity, the distribution of collisions, etc.) and the question of whether or not there is satisfactory agreement with experiment is still unsettled. However these difficulties alluded to are always well defined in the physical sense—even if one does not believe an approximation to be good it is an advance to know that it is an approximation and how the exact answer should in principle be obtained. In the reviewer's opinion, Slater's theory represents one of the most significant advances in reaction-rate theory in recent years.

The book is written in a charming personalized style all too often lacking in scientific treatises. It undoubtedly belongs on the bookshelves of all physical chemists—student and postgraduate.

Fonctions sphériques de Legendre et Fonctions sphéroïdales. By Louis Robin. Vol. 1, 201 pp., 43.00 NF; Vol. 2, 384 pp., $12.86; Vol. 3, 289 pp., $12.42. Gauthier-Villars, Paris, France, 1957, 1958, and 1959. *Reviewed by Philip M. Morse, Massachusetts Institute of Technology.*

STUDY of the solar system induced an early interest in fields with spherical symmetry and the nuclear atom has ensured a continued interest. Nowadays we cut our mathematical teeth on Legendre functions and we grow up on a diet of spherical harmonics, so to speak. Each of us has his preferred source of spherical formulas and definitions; some the earlier German Handbücher of Heine or the Neumanns, most of us the later English treatises of Ferrers or Hobson. One wonders whether another one is needed.

There have been recent developments, however, and there is still a place for a book which will discuss the details of these important functions and will treat in a consistent manner the interrelations between their various species. The usual authorities are annoyingly unhelpful, for instance, if one actually has to use the half-integer functions appropriate to toroidal coordinates. In these and similar respects the three volumes under review are a welcome and useful addition to the literature.

The first volume concentrates on the functions of integral order, of first and second kind, appropriate to the usual spherical fields. Their properties, their interrelations, their limiting values and zeros, the expansion of other functions in terms of series of these functions, are all dealt with carefully and in considerable detail. The second volume treats the more refractory functions of nonintegral order, their integral representations, their expansion in hypergeometric series, their behavior near branch-points and singularities and their asymptotic expansions. In addition the general properties of series of Legendre functions are discussed, with a great number of specific examples. The third volume deals first with addition formulas and the zeros of the functions of both kinds and then goes on to discuss the special Legendre functions which are appropriate for the expression of potential fields in prolate and oblate spheroidal, toroidal, and conical coordinates. The last chapter first deals with the relation between Legendre and Gegenbauer functions and then utilizes these results to discuss spheroidal wave functions. Here the treatment, in general, follows the more specialized treatise of Meixner and Schäfke, *Mathieusche Funktionen und Sphäroidfunktionen*.

It will take a while to be sure, but this reviewer suspects he will come to use these volumes as a mine of useful formulas for Legendre functions, just as he has long used Watson for Bessel function properties. The text concentrates on the mathematical behavior of the functions; no specific applications are discussed; but within these self-imposed limits the treatment is quite detailed. As with most books printed on the continent, the typography is good and the equations are both readable and aesthetically satisfactory. As with most French texts, the index is quite inadequate.

Theory of Elasticity. Vol. 7 of Course of Theoretical Physics. By L. D. Landau and E. M. Lifshitz. Translated from Russian by J. B. Sykes and W. H. Reid. 134 pp. Addison-Wesley Publishing Co., Inc., Reading, Mass., 1959. $6.50. *Reviewed by Ellis H. Dill, University of Washington.*

WRITTEN by physicists for physicists (as the authors state), this book presents the basic equations governing the deformation of a homogeneous continuum experiencing small displacements. This is a modern, graduate level treatment of the classical theory of elasticity. A knowledge of vector calculus is required; indicial notation and the summation convention are used throughout. Tensor quantities are identified but little use is made of the properties of a tensor. In particular, when curvilinear coordinates are used, physical components are introduced with elaboration.

In the presentation of fundamental relations, the authors are careful to reconcile the concept of stress in a continuous medium with the real nature of matter, i.e., the short-range action of the forces of interaction between molecules. The stress-strain law is derived from the principles of the macroscopic theory of thermodynamics based on the assumption that the deformation is a thermodynamically reversible process.