Méthodes et Réactions de L'Analyse Organique. Leon Velluz, Ed. vol. III: *Réactions Colorées et Fluorescences.* Maurice Pesez and Pierre Poirier. Masson, Paris, 1954. 297 pp. Paper, F. 2750.

This is the third, and last, volume of the treatise edited by L. Velluz under the general title *Méthodes et Réactions de L'Analyse Organique.* In essence, this book is a compilation of qualitative tests for various well-known kinds of organic compounds. Both organic and inorganic reagents are used to produce colored or fluorescing products.

Reactions are arranged under nine types, such as oxidation-reduction and diazotization-coupling. Under each of these, consideration is given to the action of various reagents, such as heteropoly compounds and ferric chloride, on different classes of compounds, such as alcohols and phenols.

Under principles of the reactions is a brief explanation of the chemistry involved, with many references. Following brief directions for performing the tests in each section are tables summarizing the reactants covered, the relevant references, and certain other information, such as the color produced.

In summary, this seems to be a useful collection of widely scattered information on the color-forming possibilities of many systems. I have already found valuable suggestions during a brief examination of the book. The wealth of references provides access to any needed details for specific cases.

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Theory of Games and Statistical Decisions. David Blackwell and M. A. Girshick. Wiley, New York; Chapman & Hall, London, 1954. xi + 355 pp. Illus. $7.50.

The mathematical theory of decision making has received increasing attention in recent years. The uses of the art of making optimal judgments according to various criterions occur in many fields of scientific endeavor, including economics, military tactics, business, and engineering, to cite a few examples.

To motivate the subject historically, it began when J. von Neumann and O. Morgenstern in a fundamental book presented an approach to some of the problems of economics based on a new mathematical theory called *The Theory of Games and Economic Behavior,* published in 1945. Later A. Wald, a noted statistician, recognized the relevance of game theory to statistics and exploited some of these concepts. He published a synopsis of his investigation in a book entitled *Decision Theory.* And now this book by D. Blackwell and M. A. Girshick attempts in a thorough manner to develop all the connecting concepts of decision theory and the theory of games.

The mathematical model for decision theory is a special case of that of game theory in which the statistical problem can be viewed as a contest between the statistician and nature. The precise relationship is developed in detail throughout this work. Almost all types of statistical analysis, such as testing hypotheses, estimating unknown parameters, prediction, and discrimination are cast in this framework

The first two chapters are devoted to an exposition of some of the basic elements of game theory to be used in the sequel. In Chapter 3 the statistical game is defined, and many of the motivating ideas are introduced. From here on a careful analysis is presented, for instance, of the situation in which the number of actions available to the statistician or the number of states of nature is finite. All this theory is based on the circumstance of a fixed experiment that is to be performed and the statistician desiring to choose the best course of action. Following this special treatment the authors give a thorough analysis of statistical decision theory involving no predetermined number of observations on the part of the statistician. Allowance is made for the possible performance of an infinite number of experiments with the element of cost of experimentation presenting a deterrent. The last two chapters study various aspects of estimating unknown parameters and the problem of when is one experiment more informative than another.

This book is filled with many exercises and can be used as a textbook on the graduate level. In this attempt to attract the student of statistics, as well as the professional, to this modern viewpoint of statistical theory, nowhere in the work are any of the basic ideas underlying the theory sacrificed. Although this was intended primarily as a textbook in decision theory, it contains many sections of new research and hence it can also serve as a source book for future investigations. This book will certainly occupy a fundamental place in this growing field of mathematics, statistics, and the general theory of strategy and its applications.

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Physical Properties of Solid Materials. C. Zwikker. Interscience, New York; Pergamon, London, 1954. viii + 300 pp. Illus. + plates. $8.75.

This book treats in some form most of the properties of solids. Written on an intermediate level, it is a mixture of textbook and reference book. For the most part it is devoted to presentations of experimental facts and accompanying explanations. Formal development of theory is limited to that essential for these explanations. For its avowed purpose—an inclusive summary—it is satisfactory.

The first thing that strikes the reader is the great breadth of topics considered. Few areas of the field are completely omitted (indeed, in the author's preface there is a refreshing absence of an apology for omitting this or that topic, and, in fact, none is necessary). Clearly, then, in a book of rather average length no given topic may be treated at great length. For example, in few places are alternate interpretations of

facts presented. This at times results in the author's taking a stand on some controversial point that may in the end be wrong. Zwikker is apparently willing to risk this for the sake of conciseness.

Broadly speaking, the book develops the field in the standard way. First appear introductory chapters on binding forces and lattice types along with discussion of homogeneous and heterogeneous mixtures. Then follows a good treatment of the anisotropic properties of crystals. In brief, it proceeds from the simple scalar-vector properties (for example, pyroelectricity) to the more complicated tensor-tensor properties (as far as elasticity). This section is the best in the book. After brief discussions of damping (mechanical and dielectric) and plasticity, there follow several chapters on thermal properties and finally several chapters on electron properties.

For its purpose it is well constructed and well illustrated with many line drawings and graphs. It is especially notable for the extensive use of scales to present experimental data concisely. It is written in a good style, although here and there the deletion of one or another "effect" in favor of a section tying together more tightly the previously mentioned "effects" might be advantageous. Successful use of this as a classroom textbook will require frequent use of the many original papers referred to. Perhaps for a student its best use will be its aid in reviewing for comprehensive examinations.

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Elementary Introduction to Molecular Spectra. Børge Bak. North-Holland, Amsterdam; Interscience, New York, 1954. 125 pp. Illus. $2.90.

This little book is intended for biologists, chemists, and chemical engineers who increasingly resort to empirical applications of molecular spectroscopy for the solution of their problems and naturally have a desire to understand the phenomena they apply. Such understanding is not easily achieved, however, for the dynamics of molecules and their interaction with electromagnetic radiation are intricate quantum-mechanical processes, and the classification of spectral data is based on group theory. Thus, the author has undertaken a difficult task.

The first chapter is an introductory survey of practical and theoretical spectroscopy. In the second chapter the basic postulates of quantum mechanics are stated, and an outline is given of the derivations of some of the equations used in molecular spectroscopy. The remaining three chapters give a clear and readable account of microwave, infrared, and visible-ultraviolet spectra. Because of the severe limitation of space, many important matters are omitted or treated with extreme brevity (only four pages are devoted to Raman spectroscopy!), and some oversimplifications have resulted. These chapters have been wisely written in such a manner that they are independent of Chapter II. This is particularly fortunate because, in my opinion, this chapter is the least successful. The Hamiltonian operator is introduced in a manner reminiscent of the Danish flag, which, according to legend, fell down from heaven. Moreover, very few of the expressions used in the later chapters are derived, and only for the particle in a box is the derivation approximately complete. A discussion of Bohr's concept of stationary states, with which the theory of spectra began, would be more helpful to the reader than the two tables of hydrogen wave functions.

Despite its shortcomings, which are closely related to its brevity, this book should be valuable, not only to its intended readers, but also to students who desire a quick preview of molecular spectroscopy.

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Geschichte der Mathematik. J. E. Hofmann. Walter de Gruyter, Berlin, 1953. 200 pp. DM 2.40.

This small volume is the first of several giving a brief but thorough sketch of the history of mathematics. It covers the period from the beginnings of mathematics up to the appearance of Descartes and Fermat. The author treats the mathematics of the ancient world with relative brevity and concentrates on the mathematical accomplishments of the medieval world. Although the names of practically everyone who made any contribution to mathematical knowledge are here, Hofmann can do little more than list them. Nevertheless several figures among the ancient and medieval mathematicians have been singled out for detailed treatment.

This book has excellent bibliographic material, ranging from references to works of general cultural history to original textbooks used in the period discussed. In addition, there is an index of the mathematicians mentioned with bibliographic information for each. These features contribute to the usefulness of this as a reference book as well as for a quick review. However, it is far too dull and sketchy for the general reader.

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Précis de Minéralogie. P. Lapadu-Hargues. Masson, Paris, 1954. 311 pp. Illus. + plates. Cloth, F. 2200; paper, F. 1700.

The purpose of this small book, as stated in the preface, is to interest students and scientists concentrating in other fields in the general aspects of descriptive mineralogy. The first section is very brief in its description of the concept of a mineral and the methods that are used to characterize them. The major portion of the book is devoted to the descriptive mineralogy, which classifies approximately 350 species.

While the pattern of other older familiar works on descriptive mineralogy predominates, the author has strived to introduce into the descriptive section mate-