also neglected. Indeed, the treatment of statistical distributions and of the Boltzmann equation is abbreviated to a one-page statement; partition functions are not mentioned, even though the populations of states are computed. Thus, equations 14 and 15 on page 53 are misleading since N_0 is a function of the temperature. I hope these defects will be rectified in a second edition of this useful book. Barrow might find it advantageous to summarize more clearly the diverse structural information that may be derived from spectroscopic studies, including nuclear magnetic resonance.

By comparison with Barrow's book, the second edition of Bak's compact outline suffers considerably. Except for the addition of chapter 6, on nuclear magnetic resonance spectra, the current version differs in no essential respect from the first edition published in 1954. As a compilation of formulas, this book may prove quite handy; it is suitable for a person who knows no spectroscopy but who is conversant with mathematical operations. Bak relies almost entirely on the analytic representation of the solutions of the wave equation for the various models. He discusses these solutions briefly and presents orders of magnitudes, sometimes in tabular form. Practically no data concerning real molecules are included. For each range of the spectrum, he outlines the type of molecular information that may be deduced from the data and the precision that can be attained, and he cites the appropriate expression for the corresponding factor in the partition function.

All books written for students should be scrutinized not only for errors but also for correct but awkward statements that may prove misleading. Neither author discusses what occurs when a photon interacts with a molecule in the case where the resonance condition is not satisfied or gives an adequate analysis of the sequence of events in the case where the resonance condition is satisfied. Barrow fails to explain what is meant by the term *state*. His treatment of two interacting particles, on page 31, is confusing, and on page 53 he sneaks in the condition that both the total angular momentum and its component along some direction must be quantized. There are regrettably many troublesome spots in Bak's book. The invocation of the uncertainty principles to explain the fuzziness of translational levels in many-particle systems will certainly confuse beginners. The potential function, as it is drawn on page 18, leaves a wrong impression of the relative magnitudes of r_e and r when $V = D$. The erroneous formula on page 99 was carried over from the first edition. There are others, but the last paragraph on page 98 is a dilly!

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Mostly for Physical Chemists

Catalysis by Metals. G. C. Bond, Academic Press, New York, 1962. ix + 519 pp. Illus. $15.50.

Although heterogeneous catalysis is well served by a large supply of specialized review articles (for example, those in Emmett's treatise and in the annual volumes of *Advances in Catalysis*), there is a dearth of single-volume monographs. The present book makes a useful contribution by dealing in one volume with the general area of catalytic reactions on metals. The viewpoint is primarily that of a physical chemist. The author makes no attempt to deal with industrial catalytic procedures, and his coverage of descriptive catalytic chemistry is very selective. For example, the hydrogenolysis of benzylic derivatives is not mentioned, Ipatieff does not appear in the author index, and Homer Adkins appears but once. The book will not be of great utility to the organic chemist who seeks merely the best procedure for converting A to B. Rather, the treatment is aimed at the elucidation of the mechanism of heterogeneous catalysis in its broadest sense, and the selection of material is so conditioned.

The introductory portion of the book (150 pages) covers the physics and chemistry of metals, adsorption, and the kinetics of reactions on surfaces. Except for a chapter on catalytic oxidation, the remainder of the book deals primarily with catalytic reactions of hydrogen; this material is organized into chapters on various types of reactions, hydrogenation of carbon-carbon double bonds, isotopic exchange reactions between deuterium and hydrocarbons, hydrogenation of carbon monoxide and of nitrogen, and the like. Considerable emphasis is given to studies that involve isotopic tracers and to the determination of kinetic orders, activation energies, and frequency factors. Some may suspect that the author underestimates the degree to which serious concentration gradients are involved in the data he employs and others, that activation energies and frequency factors are given more space than their contribution to the understanding of the subject warrants.

One finishes the book with the feeling that, although many particular aspects have been well explained, the overall level of explanation is weak and tentative, particularly as it relates to the correlation between the catalytic properties of a particular metal and any of its other properties. This is not the fault of the author but of the present state of our understanding. Bond has written a book which will be widely used by catalytic chemists.

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Potential Laboratory Tool

Absorption Spectroscopy. Robert P. Bauman. Wiley, New York, 1962. xiv + 611 pp. Illus. $12.

This book of over 600 pages is designed both as an elementary text and as a guide for those who need a working knowledge of absorption spectra but to whom the classroom is no longer available. In view of the wide range of subject matter covered, the author has done well in presenting a clear concept of the nature of absorption spectra, of methods for measuring them, of their interpretation, and of their value in qualitative and quantitative analyses and in research.

The book is divided into ten chapters, each of which is followed by a list of pertinent problems that not only enhance the book's value as a text but should also help readers to appreciate absorption spectroscopy's great potential as a laboratory tool. One chapter is devoted to the classical optical principles around which spectrometers are built. Another treats the basic design of instruments and describes in some detail a number of currently available commercial instruments which among them cover the spectral range from infra-

red down to about 2000 Å in the ultraviolet. Raman spectroscopy is also included. Another chapter is concerned with sample preparation, appropriate solvents, cells and cell windows, and the like. Several chapters are devoted to theoretical aspects and to interpretations of absorption. These include brief treatments of classical and quantum mechanics, electronic states and electronic spectra, molecular vibrations and rotations, and the principles of molecular spectroscopy. One chapter treats the use of absorption as a tool of qualitative analysis, demonstrating its value both in identifying compounds and in showing the presence of characteristic groups in unknown compounds. Still another chapter explains and demonstrates how absorption spectra may be used to analyze quantitatively a mixture of several absorbing compounds, and as an aid in this treatment, matrix methods are treated in an appendix. Other appendices consider nomenclature and character tables.

This book meets an extensive current need, and in addition to its classroom functions, it should find a place in many libraries and research laboratories.

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Fluorometry

Fluorescence Assay in Biology and Medicine. Sidney Udenfriend. Academic Press, New York, 1962. x + 505 pp. Illus. $14.

Although this book fulfills its purposes, namely, to serve as a practical reference and laboratory manual on fluorometry for those who are engaged in various fields of biology and medicine, it is written in such an informal and elementary manner that it is primarily a text for the truly unsophisticated novice. This is regrettable, in view of the much more urgent need for an authoritative text, which this book might have been, that would provide a frankly critical evaluation of the instrumentation and methodologies presently applied in fluorometry, not only for the practical applications of chemical assay but, perhaps more importantly, for the purpose of obtaining the unique information about molecular structure and properties that can be derived from carefully determined spectral measurements of fluorescence (and phosphorescence). Although they will be gravely disappointed by this default, those who are already knowledgeable or who are experts, to use the author's euphemism, will nevertheless find this book of some value, not simply as a handy reference intended for useful practical information but more so for its very comprehensive and fairly up-to-date bibliography.

The major portion of the book is devoted to specific assays of various compounds, arranged in topical order according to their biochemical classification; this, of course, leads to grouping the compounds in a chemically unrelated manner. This may be a convenient and possibly logical arrangement for a laboratory manual in biochemistry, but it was ill-chosen for a general reference text on fluorescence assay, in which the correspondence of molecular structure with the physical property of fluorescence is of major topical concern. Moreover, the procedures that have been detailed are incorporated in the main body of the descriptive text; this is a particularly poor format for a working laboratory manual, since each specific assay must be sought out.

The last three chapters are somewhat perfunctory surveys of the extension of fluorescence assay to a number of applications which most likely will be of only passing interest to those concerned with the basic assays that comprise the major sections of the book. However, the initial chapters on instrumentation and on the practical considerations to be taken into account in the technique of fluorometry merit attention, particularly by those who seek some practical guidance on the type of instrumentation and the technical requirements that need to be considered for specific types of application.

By having the temerity to write an introductory text on a discipline that is in such an extraordinarily dynamic phase of growth and new development as a result of the remarkable advances being made in modern technology, this competent author has exposed himself to the basic criticism that such a laboratory manual is somewhat premature and that it is predestined to a very short lifetime of useful service because of the great pressure of change; this change is not only within the particular sphere of fluorescence but also in contesting disciplines which potentially could adumbrate its practical significance and usefulness. The task, it would seem, for those who would further the use of fluorometry as a basic technique, is not its popularization, which could lead to discreditation by abuse and misuse as a result of the push-button nature of modern instrumentation, but rather to provide the necessary guidance, either by demonstration or instruction, for its properly sophisticated use.

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Natural Continuum

The Sciences and the Arts. A new alliance. Harold Gomes Cassidy. Harper, New York, 1962. 182 pp. $4.75.

The author, a professor of chemistry at Yale, attempts to fling a philosophical bridge between the "two cultures" —science and art. The result is a brilliant and highly abstruse analysis.

Cassidy asserts that "if humanists understood science and would effectively make their voices heard, they could, with the aid of scientists, control the forces of cultural change in the process of their actual generation." He goes further and asserts that such a conjunction would enable men to direct cultural change toward "the morally and ethically just ends that arise from a union of art and science."

Of what is this bridge to be constructed? The central argument of the book is that a natural continuum exists between all of the disciplines of the intellect; every activity is a dialectic, interpenetrated by "analysis, synthesis, and reduction to practise." All three activities, he says, "must go together for science or art to be healthy." He asserts that it is a failure to distinguish between the analytic and synthetic functions, accompanied "often by a preference for one or the other," which is "one of the chief causes of schism between scientists and humanists."

To demonstrate the continuum, Cassidy presents several delightful essays comparing the processes involved in a mathematical theorem with those in a poem, those in geometry with those in sculpture, and so on. He brings to these essays a certain architectonic flair: "There are," he writes, "too few constructive efforts to bring