ankle-deep mud, but it can be done much better and much more enthusiastically on a good cinder track. This suggested program of new equipment would run into tens of millions of dollars, but the stakes involved are three orders of magnitude higher.

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Measurement Technology

Instrumentation for Engineering Measurement. R. H. Cerni and L. E. Foster. Wiley, New York, 1962. xii + 456 pp. Illus. $12.50.

The dramatic advances in measurement technology during the last decade would justify a series of books for a variety of readers. Cerni and Foster have provided a valuable reference for nonspecialists who need practical information on how to obtain and process data in the field or laboratory. The emphasis is on the measurement aspects of instrumentation, with only incidental reference to control aspects.

Perhaps the most valuable contribution is the comprehensive review of modern measuring components and systems. The treatment of sensors and transducers is encylopedic; explanations are easily followed, and carefully selected line drawings clarify the descriptions. The typical treatment consists of a statement of basic principle of operation, a description of practical devices, a specific discussion of performance characteristics, and a summary of the advantages and disadvantages of the device in comparison with alternative devices.

A similar treatment of data indication and recording methods provides useful information on the characteristics of electrical, optical, magnetic, analog, and digital devices. This material, like that in the section on sensors and transducers, is descriptive rather than analytical, and it can be understood and used with benefit by engineers or scientists with limited backgrounds in instrumentation.

In contrast, much of the material on telemetry, data transmission, and data processing requires some specialized knowledge of communication theory for ready understanding of the brief mathematical analyses presented. Apparently telemetry is a field of special interest to one of the authors, and as a result, this topic is treated on an entirely different level from that of the material in the earlier part of the book.

Perhaps the major weakness of the book is the lack of homogeneity in the technical level. Instrumentation engineers who wish to extend their knowledge of telemetry will have no use for the elementary discussion of systematic and random errors or for the description of the D'Arsonval movement. On the other hand, mechanical engineers will have great difficulty following the brief discussion of feedback and stability or the analysis of pulse-position modulation and pulse-code modulation systems.

For the experimenter with a difficult measurement problem, this book provides a good review of a great variety of modern methods. It may not solve his problem, but by clearly pointing out capabilities and limitations of practical devices and systems, it should help him along the road to a solution.

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Investigative Tool

Introduction to Molecular Spectroscopy. Gordon M. Barrow. McGraw-Hill, New York, 1962. xiii + 318 pp. Illus. $10.75.

Elementary Introduction to Molecular Spectra. Børge Bak. North-Holland, Amsterdam; Interscience (Wiley), New York, ed. 2, 1962. xi + 144 pp. Illus. $6.

The theory, experimental techniques, and results of molecular spectroscopy have been discussed in numerous books and summary papers, both brief and lengthy, at a wide range of levels. Any addition to this literature should be evaluated in terms of how successfully the author achieves a selected objective. Barrow and Bak indicate in the prefaces to the books reviewed here, which they undertook to prepare for beginners (that is, for students and workers in biology, organic chemistry, and so forth), concise, simple, and easily absorbed summaries of the concepts of molecular spectroscopy. Barrow was considerably more successful than Bak in attaining this goal. Neither author devoted more than a few general remarks to experimental techniques, and both found it necessary to incorporate rudimentary discussions of wave mechanics.

Barrow takes the slightly willing student by the hand and gently nudges him through 11 chapters that are graduated in mathematical sophistication and in complexity of subject material. With the aid of simplified examples and graphic illustrations he manages to bridge the gap between advanced treatises on molecular spectroscopy and the cursory treatments that may be found in unconnected chapters of the currently popular melange of "Physical Methods for . . . ." This introductory volume, which is set up in textbook form, requires no prior knowledge of quantum mechanics or of group theory. Those who follow the text seriously and correctly complete all the problems will find their efforts rewarded with a fairly good understanding of molecular spectroscopy (but not of quantum mechanics or of group theory). The chapters on the physics of absorption and emission of radiation and those on molecular symmetry, group theory, and normal mode analysis are well written. The treatment of electronic spectra is necessarily highly abbreviated, but the crucial roles played by the quantization of angular momentum and by the symmetry of the molecular wave functions are properly stressed.

The author and publishers should be commended for the format of this book. The paper, printing, and binding are very good, and there are enough carefully prepared diagrams to be of considerable help, particularly to those students who find it difficult to visualize the shapes of functions of several variables. The "order of magnitude" estimates are also instructive; quotations of values for real molecules are a bit sparse, perhaps inadequate to indicate the range in magnitudes that one encounters.

In my opinion there are two serious omissions. Raman spectroscopy is mentioned once (on page 2) and nothing is said about selection rules for Raman transitions or about how these facilitate the establishment of molecular symmetries, even though these topics were discussed at some length for infrared absorptions. The use of molecular parameters, as derived from spectroscopy, to compute thermodynamic functions is