In the opening paper it is noted that Australia is the world's driest continent (it has the lowest runoff per unit area). However, water does not yet limit Australia's growth. In a section entitled The National Outlook, the present and future water needs for hydroelectric power, irrigation, and municipal and industrial uses are considered.

The second series of papers, entitled Basic Data, describe records and measurements of precipitation, evaporation, surface water, and underground water in Australia. This section also includes three papers on analysis and processing of hydrological data.

Eleven papers in the general category of "water balance" range from predicting flood flows to discussion of problems of irrigated areas. Socioeconomic problems of water resource use and management are discussed in four papers, and a final four deal with water investigations and research. These papers stress a need for increased efforts in data collection, research, and long-range planning—points that are mentioned many times in separate papers throughout the volume.

This compilation should be of value to those involved with water resource use, administration, research, or planning in Australia. Because it is directed specifically at Australian conditions and problems, which of course was its purpose, the total interested readership may be limited. Those seeking information on new technology will likely be disappointed.

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Techniques and Interpretations

Spectroscopic Properties of Rare Earths. Brian G. Wybourne. Interscience (Wiley), New York, 1965. x + 236 pp. Illus. $10.50.

Rare earths, in the spectroscopist's mind, are associated with large quantities of information and thick volumes containing numbers. It is, therefore, a pleasant surprise to see a new book entitled *Spectroscopic Properties of Rare Earths* which, despite its title, is quite small in size. The book contains, however, invaluable information. The second chapter is a very clear and useful presentation of Racah techniques, which are so easily displayed that they can be used immediately, even by spectroscopists who are not so familiar with the difficult chapters of the theory of complex spectra. In fact, the author, in chapters 3, 4, and 5, applies these techniques, very systematically, to three major problems in atomic spectroscopy: intensities, Zeeman-effect, and interaction with the nucleus.

In addition to a general treatment of each problem, which includes the evaluation of the matrix elements of all the involved operators in the L-S, J_1-j, and J_1-l coupling schemes, the author gives several particular examples that are of utmost importance and interest.

A distinguished feature of the book is the extensive list of references (487) which brings all the subjects discussed up to date. The author was scrupulous in giving credit to the various scientists. He has, however, incorporated quite a few of his own ideas into the text. One example is the application of J_1-j coupling calculations to the $f^N s$ type configuration, as in §5-5 for Pm II, thereby disproving the commonly stated argument that "since s-electrons are penetrating electrons, the contribution of the f^N core to the hyperfine structure may be ignored."

Considerable space is given to discussion of the spectra of the rare earths in crystals. One of the interesting effects in these spectra is the nephelauxetic effect, which could not be checked by the time the book was written. Since its publication, however, new data have been found in Pr^{3+} free ion, which include all the energy levels of the $4f^2$ configuration (except $^1S_0$). The analysis was done by Sugar, who also calculated the parameters of this configuration. He showed that, indeed, the free-ion parameters are larger than those obtained from crystal spectra.

The book is, unfortunately, not free from misprints. I would like to point out the misprint on page 102 where $g = 1.05116$ should read $g = 1.50116$.

On the whole, with its general treatment of the spectroscopic properties of the rare earths as well as the fine and revealing specific examples it contains, the book should be very useful for the experimental spectroscopists who are interested in the theoretical interpretation of their results.

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Biological Research

Instrumental Methods of Experimental Biology. David W. Newman, Ed. Macmillan, New York, 1964. xiv + 560 pp. Illus. $15.

The editor states in the preface that this book is suitable for use as a single textbook for courses on methods, techniques, and instrumentation. The dust jacket indicates that it is "a presentation of the fundamental theory and techniques for biological instrumentation." Although the book presents some useful material, it is not sufficiently organized or balanced for use as a textbook. The 15 chapters, contributed by 17 authors, are varied in length, style, level, detail, and adequacy of references. The introduction identifies physical methods with instrumental methods and thereby includes chromatographic separation methods with instrumental methods. In previous publications these methods have generally been included under physical methods, and those methods in which physical principles are utilized to "refine the senses, measure and/or control" have been included in instrumental methods.

The first five chapters present paper, thin-layer, column, and gas chromatography and zone electrophoresis with a minimum of theory. Practical procedures are emphasized, some commercial equipment is described, and detailed procedures are outlined for specific separations. The instrumentation involved is neither explained nor evaluated; conspicuous omissions include column and gas chromatographic methods for amino acids, gel filtration, and immunodiffusion technques.

Freeze-drying techniques are described in practical terms, with some advice on the use of commercial equipment. I was pleased to note that "lyophilization" was described as an unnecessary word.

In the well-illustrated chapter on ultracentrifugation the fundamentals are presented in a lucid text which precedes a detailed mathematical presentation of theory (in fine print). Practical illustrations and extensive references make these 87 pages by Rodes Trautman particularly valuable. The short chapter on weighing sets forth some useful points on the tolerances of the standard classes of weights but provides no treatment of the submicrogram methods. The chapter on *p*H gives only the elementary buffer equa-

tions and the general scheme of industrial instruments. Little practical information is given except that which is available in instruction manuals. High-resolution instruments, microelectrodes, carbon dioxide tension, and the Na^+ and K^+ electrode systems are not mentioned.

In the chapter on ultraviolet and visible absorption spectroscopy the basis, form, and functions of commercial spectrophotometers are presented. Fluorescence and flame photometric methods are only briefly mentioned. Other emission methods and atomic absorption are not included.

In some 33 pages on infrared absorption spectroscopy, Clara D. Smith presents a succinct review of the elements of infrared absorption methods and their value in biochemistry. A chapter entitled "Manometric devices" presents classical Warburg techniques in 11 pages, with no mention of Cartesian diver methods. In the chapter on osmotic pressure measuring devices, some classical methods are described but instruments that have been available for several years are not considered.

A chapter on transducers and one on read-out devices are concerned with what is generally conceded to be instrumentation in that the physical basis and limitations are given for a number of important transducers in current use. Measurement of nuclear radiation is treated only in relation to the elementary principles of the transducers. The instrumentation of scintillation counters, pulse-height analyses, and data handling are omitted. Discussion of solid-state devices and the consequences of their availability in modern instrumentation is conspicuously absent.

In the chapter on read-out devices digital devices are mentioned but no distinction is made between digital computers that handle the data in digital form and those that use an analog method and present the data in digits derived from the analog function.

The effort to provide a book on instrumental methods for the biologist is commendable, but the scope of the field is so great that any rational effort must involve selection which, I feel, should have been more discriminating. The book should have been more suitably titled.

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A Collection of Mathematical Problems

The Pleasures of Math. A. W. Goodman. Macmillan, New York, 1965. 224 pp. Illus. $4.50.

The principal attraction of this book is an extensive collection of problems that range from the extremely simple to the very difficult. The author has made a nice selection of topics that should be stimulating to those high school and beginning college students who wish to supplement their mathematics studies. However, those who wish to supplement their study of trigonometry, probability, or calculus must look elsewhere.

Goodman says that he has aimed at four classes of readers: high school students, high school teachers, college students, and parents. I do not think that he will carry along many of the last group. The author states that "a student who finishes this book . . . is fully prepared to start calculus." One might question this assertion in view of the omission of trigonometry and the slight attention given to analytic geometry. However, his primary purpose seems to be to entertain, and he has achieved this quite well.

Some statements may lead to misunderstanding: for example, "Not all inequalities involving a positive integer n require mathematical induction"; "if this assertion is not obvious, it can be proved by mathematical induction"; and "we have proved this principle (of mathematical induction)." Terms such as "smaller" polygon, "dominant" term, and "series" appear without definition. The definition of "divisor" does not exclude zero and the prime factorization theorem does not exclude one. The fundamental principle of counting is "proved" and extended to k factors without mathematical induction. The greatest common divisor is discussed without reference to the Euclidean algorithm.

The book (224 pages) includes an index, a bibliography of 30 titles, and answers to all the problems. Magic squares, the four-color problem, conic sections without coordinates, extremes without calculus, and the theory of numbers are discussed. The 35 sets of problems form the major contribution of the book.

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Economics: Agriculture and Economic Development

Economic Crises in World Agriculture. Theodore W. Schultz. University of Michigan Press, Ann Arbor, 1965. viii + 114 pp. $3.50.

In the four chapters of this book, Theodore Schultz examines the role of agriculture in the economic development of less-developed and developed countries. He treats the matter in terms of two agricultures. One is the "traditional" agriculture characterizing less-developed countries. Another is the "modern" agriculture characterizing the developed countries, especially the United States.

Schultz's thesis is that, within both the traditional and modern agricultures, there comes a juncture in economic development wherein a stagnant and depressed agriculture causes a crisis. However, the crises within the two agricultures are wholly different. The book is devoted to examination of causal factors generating these crises and to possible avenues of escape.

The two initial chapters, drawing heavily upon his earlier book *Transforming Traditional Agriculture* [Yale University Press, 1964; reviewed in *Science* **144**, 688 (1964)] deal with the nature and explanations of the crisis within agricultural sectors of less developed countries. The third chapter appraises the efforts made by the United States to assist less-developed countries in their efforts to modernize their agriculture. The fourth and final chapter examines the nature and possible explanations of the crisis in modern agriculture, with special reference to the United States.

Within the traditional agricultures, Schultz concludes that their serious food shortages can be solved only through large increases in agricultural production and marked declines in population growth. Aside from noting the retarding consequences of population growth on improvement in food supplies, Schultz leaves the population question and concentrates on in-