ing need of ordered analysis and evaluation.

Although its title might suggest that the book is of interest primarily to tree physiologists, wood specialists, and forest botanists, it deserves a wider audience because of its broad approach and the depth of its treatment of the specific subjects covered. General botanists, plant anatomists, plant physiologists, and plant biochemists should find many of the papers more readable and more interesting than papers on similar subjects in technical journals.

The book is well printed, bound, and illustrated and has author and subject indices. Many significant literature references, including those to papers mentioned in the discussions, are provided. It seems unfortunate that the references to papers generally lack titles and sometimes lack inclusive page numbers. Such omissions are an annoyance to scholars who do not have direct access to the few great biological libraries. Complete bibliographic information is a great aid in deciding which works are worth borrowing on interlibrary loan.

The editor and publisher deserve praise for getting this well-produced book, quite free of errors, into print while the factual information and discussions that it contains are still relatively fresh.

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Chemical Technology

Methods of Quantitative Inorganic Analysis. An encyclopedia of gravimetric, titrimetric, and colorimetric methods. Kazunobu Kodama. Interscience (Wiley), New York, 1963. xiv + 507 pp. Illus. $22.

This book contains a comprehensive summary, complete through 1957, of published methods in the fields of inorganic gravimetric, titrimetric, and colorimetric analyses. The book is divided into three parts. Part 1, General Considerations (41 pages), contains brief information of a general nature on sampling, the solution of samples, separations, and determinations; part 2 (56 pages) is devoted to organic reagents used in inorganic analysis, classified by their reactions. Part 3 consists of more than 300 pages in which are outlined the determination of the elements, listed according to the classical order used in Hillebrand and Lundell's book. Each element is considered according to methods of attack, separation, and determination. The selection of methods appears to be good, and extensive use is made of tables and flowcharts. Sufficient information is given, in most cases, to permit selection of the method most suitable for a given problem.

The method of presentation and the good general index add to the usefulness of the book and the extensive index of organic reagents is especially valuable. Some 4000 references make this volume a virtual key to the literature of classical chemical analysis.

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Mathematics

Fundamentals of Scientific Mathematics. George E. Owen. Harper, New York, 1964 (© 1961, Johns Hopkins Press, Baltimore, Md.). xii + 274 pp. Illus. Paper. $1.75.

Although this book is very attractive and most ambitious in its purpose, it fails, on the whole, by trying to do too much. Its five chapters cover the topics of geometry and matrices, vector algebra, analytic geometry, functions, and differential and integral calculus. The audience is claimed to be high school seniors and college undergraduates, together with high school teachers of mathematics and science; few of them will have the background or the patience to follow the condensed treatment of such a book as this. It may serve as a review or as a new viewpoint on old ideas for one who knows most of the material, but it will teach little. For example, there are no exercises in the book, and who ever heard of learning mathematics without doing some? There should be a special bow, however, to the attractiveness of the illustrations and their general excellence. Only occasionally are they confusing or inappropriate (examples to illustrate the comment will be found on pp. 6, 7, 8, 11, 26, and 29). The first chapter is one of the poorest; the quality improves in the others, with the chapter on analytic geometry one of the best.

Mathematics is treated completely as a tool, with little evidence of an understanding of the logic of mathematics, its motivation, or its structure. This is a common failing with engineers, but not so common with physicists, and it leads to a cookbook approach to procedures which stress rules without reasons (p. 21). Although there is a great deal to be gained by using physical and geometric introductions to aid intuition, the clarity of the mathematics often suffers. Another influence of this mechanical approach to mathematics is found in such careless statements as the following: "Q is very close to P" (p. 20), and in an apparent confusion between the uses of approximate differentiation and integration and the exact uses of these processes. It is unusual to try to explain the approximate methods before explaining the exact ones which they approximate.

There are mathematical deficiencies and mistakes. The fuzziness of the language sometimes gives the impression that the book has been translated from a foreign language. Examples of awkwardness are found in the introduction of right and left handed coordinate systems (pp. 12, 13); the general discussion of coordinates (p. 16); cylindrical and spherical coordinates (p. 17); scalar multiplication (p. 65); intervals (p. 167); and derivatives (p. 207). Simple mathematical ideas are muddled—for example, the associative law, the distributive law, and the law of cosines (p. 68). Inexact expressions creep in: the "length element" (p. 18); and two vectors "form a plane" (p. 75). The idea of limit is poorly introduced (pp. 203, 207), and the concept of *function* is hopelessly out of date (p. 167). Basic words such as *definition* and *proof*, fundamental in mathematics, are not properly used (pp. 68, 219). Finally, a symptom of the lack of contact of the author with mathematics is his misspelling of such common words as chord (spelled cord) and paraboloid (spelled parabloid).

It is not clear what background is assumed for this book, or whether that background is appropriate for this type of book. There are places where trigonometry is assumed (pp. 19, 220), but also the summation notation (p. 28), determinants (pp. 33, 45), and the power series expansions for trigonometric functions (pp. 20, 211).

Some terms are used before they are explained in the book, or they are not explained at all. Will Coriolis accelerations (p. 22) be understood? Vector sum is used on pages 23 and 35 and then defined on page 64. Scalar multiplication of matrices is used (pp. 32, 34) before it is formally introduced. The coefficients for quadratic forms—A_{11}, A_{12}, and so on—are used (p. 116) but never explained.

Motivation is sometimes missing. Advanced ideas are assumed and fundamental ones proved. Here are a number of examples: why is distance invariant on page 25; does one example for transformation of coordinates suffice on page 26; why do the decimals appear as they do on page 36; why is the magnitude of the matrix not zero on page 45; why is cT substituted for T on page 52; why is the unit vector dimensionless on page 66; and why do the asymptotes of hyperbolas follow from the discussion on page 119?

Without trying to spot all errors in printing, I noted some on pages 10, 46, 49, 57, 176, and 182.

In the hands of a skillful teacher this book could come to life and be the basis for a fascinating course, but it does not stand on its own feet. It is too condensed to be useful and too vague with respect to the audience it expects and the background it assumes.

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Photosynthesis

Primary Processes in Photosynthesis. Martin D. Kamen. Academic Press, New York, 1963. xii + 183 pp. Illus. $5.50.

The author has defined his task as that of writing a book which will introduce both students and veteran researchers to the newly developing studies of the fundamental physics and physical chemistry of the primary events in photosynthesis. Following the course of events initiated by the arrival of a light quantum at the photosynthetic apparatus, he divides the subsequent processes into "eras"—the era of radiation physics (10^{-15} to 10^{-9} second), the era of photochemistry (10^{-9} to 10^{-4} second), the era of biochemistry (10^{-4} to 10 second), and the era of physiology and ecology (after 10 seconds). His book is restricted to the first two eras.

Those whose backgrounds are in biology and biochemistry will find this an excellent guide to understanding the importance, the language, the methodology, the instrumentation, and the preliminary successes of the more physically oriented approaches to photobiology. Among the topics covered are the light absorption act itself, energy migration, lifetimes and quenching processes of excited states, charge transfer processes, polarization of absorbed and emitted light, resonance phenomena, and difference spectroscopy. Wherever possible, the physical concepts are discussed first with reference to simple monoelectronic, monatomic, or diatomic systems, and the additional features are sketched out for extending studies to the macromolecular systems of the living cell.

Those who approach photosynthesis from the more physical disciplines will find in the book a balanced perspective of the biological setting of the problem. Bacterial and green plant photosyntheses are viewed as similar situations, whose differences should be exploited for the unraveling of some of the complexities of the primary photochemical events.

The problem of photosynthesis, as defined in the first chapter, is to "pump up" electrons from a region of high electron affinity, water, to one of low electron affinity, a primary electron acceptor that mediates between the pigments and the carbon dioxide to be assimilated. Emphasis is placed on the possible role played by important constituents of the chloroplast and the chromatophores, especially by the various forms of chlorophyll, by the other photosynthetic pigments, and by the heme proteins. A thorough review is given of the structural organization of the photosynthetic apparatus. Special attention is given to the experimental and theoretical bases for energy migration and trapping at special reactive sites and for charge separation within pigment aggregates or within a pigment-heme protein complex. The possible role of atom, as opposed to electron, transfer, in primary photochemical events has perhaps been underestimated.

This book should help to bridge the communication gap between the various fields that are contributing to the current activity in photosynthesis. Since a reader who wants more detailed information may be directed to original sources by the excellent bibliography, the author may be forgiven for the occasional use of the same term for two different things, for some contradictory descriptions of certain proposed models, and for the errors introduced in the attempt to simplify spectroscopic concepts.

Kamen wisely did not attempt to synthesize a complete picture of photosynthesis, noting that many important problems are now in a very active stage of research. In fact, very few references are taken from publications after 1960. He has given us an authoritative statement of the current problems, a guide to a critical evaluation of the growing literature, and a renewed enthusiasm for approaching photosynthesis as a whole life process rather than as a collection of isolated steps.

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College Calculus

College Calculus with Analytic Geometry. Murray H. Protter and Charles B. Morrey, Jr. Addison-Wesley, Reading, Mass., 1964. xiv + 897 pp. Illus. $11.50.

In the preface the authors make the following statement: "This text, together with *University Calculus* by Charles B. Morrey, Jr., is designed to solve the problem described above." The problem is that of shifting students between the regular course in calculus and the honors course, after perhaps a semester. Regardless of the direction of the transfer, the student is usually penalized by the incongruence of content in the two courses. After comparing the content of these companion texts, one must agree that this disparity of content will not be a problem if these texts are used. It is also fair to say the texts are written at sufficiently different levels of sophistication to justify their use in courses taught at such different levels as the regular and the honors course. In *College Calculus* the student is frequently referred to *University Calculus* for proofs of theorems stated without proof or for more complete details of proofs.

Otherwise *College Calculus* is largely traditional in content and approach. One noteworthy exception is the treatment of the differential, which is in-