color, taste, and other characteristics commonly used by foresters but rarely recorded for the tropics. The wood of the tree (cacti, ferns, and bamboos are "trees" in this text) is described, and compiled data are given on its specific gravity, hardness, uses, and milling properties.

The introductory material contains an excellent review of forests and forestry in Puerto Rico and the Virgin Islands. A bibliography of 40 titles, published between 1866 and 1964, includes a reference to a Spanish edition of this book (planned to include colored plates) which, in December 1964, is still in page proof. The lists that group species according to special characteristics—for example, colored sap—present a laborious exercise when referred to, rather than serving as an informative compilation, because numbers are used instead of names to "save space." Although the species treated in the text belong to 68 families, a key to the plants contains entries for 88 plant families and numerous genera not otherwise listed. A remarkably complete index of 20 pages, each with three columns, is a valuable section of the book.

A book of this size with 254 illustrations and figures, and priced at $4.25, is a botanical bargain. Regrettably it is not completely praiseworthy. The book has been in preparation since 1939, and many of the illustrations were prepared by obviously unskilled helpers. Although, superficially, the illustrations give an impression of each of the plants being described, the majority are, in fact, poor examples of botanical drawing; many are unfinished, many are inaccurate in detail, and all cast unjustified suspicion on the actual reliability of the text. Although the text has been brought "up-to-date" in some ways, careless proof reading, numerous errors in terminology, and unclear sentence structure decrease its usefulness. A one-page key (p. 25) contains eight erroneous page references among the 17 listed. Descriptive absurdities, such as Tree Fern Family having leaves with "spores in brown dots beneath" and the Bombax Family having "fruit a large oblong capsule with hairy seeds," are all too numerous. Nevertheless this text does serve a useful purpose, and it provides a basis for improved future editions.

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Mathematics

Functions of a Complex Variable. And some of their applications. vol. 1. B. A. Fuchs and B. V. Shabat. Translated from the second Russian edition (Moscow, 1959) by J. Berry. J. W. Reed, Translation Ed. Pergamon, London; Addison-Wesley, Reading, Mass., 1964. xvi + 431 pp. Illus. $10.

A reasonable balance has been drawn between theory and applications in this introductory textbook on functions of a complex variable. It includes the standard topics in the theory and at the same time abounds in significant applications. Although all of the material found in a complex analysis course is mentioned in the book, the level of rigor and depth of the treatment falls short of that needed for a one-year course in complex analysis. This is the kind of a text that is suitable for undergraduates or beginning graduate students who are interested in applications (engineers and scientists) and for a one-semester introduction to the subject for the pure mathematics students who will take a more penetrating course later. There is probably much more material between the covers of this book than can be covered in a one-semester course, but it is so organized that the topics (pure and applied) can be sampled as the teacher wishes.

The approach is very strongly geometrical. Stereographic projection is introduced to define the complex sphere. The elementary functions are studied by means of the conformal mappings they give. Although the Riemann mapping theorem is not proved in the book, it is carefully stated and frequently used as a tool in developing both the theory and the applications. The book contains an excellent intuitive discussion of the idea of a Riemann surface, with many examples and applications. The physical applications concern three basic fields: the velocity field of a fluid in motion, the electrostatic field, and the heat flow field. These subjects are developed rather extensively to illustrate how conformal mapping and the consequences of the Cauchy integral theorem are used.

The eight chapters are "The fundamental ideas of complex analysis"; "Conformal maps"; "Elementary functions"; "Applications to the theory of plane fields"; "The integral representation of a regular function"; "Harmonic functions"; "Representation of regular functions by series"; "Applications of the theory of residues"; and "Mappings of polygonal domains." Chapter 3 includes a rather thorough treatment of the linear fractional (bilinear) mappings, although the cross ratio is omitted. Chapter 5 contains a discussion of the Dirichlet problem for harmonic functions and the Green's function. Chapter 6 includes an analysis of the singularities of analytic functions and analytic continuation. Chapter 7 discusses the Mittag-Leffler theorem (without a proof) and the gamma function. The last chapter treats the Schwarz reflection principle, the Schwarz-Christoffel mappings, and a geometric introduction to the Jacobian elliptic integrals. There are approximately 17 problems at the end of each chapter and answers and hints at the end of the book. The translation from the second Russian edition is very good, although some slips, such as the incomplete statement of theorem 15 (p. 266), seem inevitable in any first printing.

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Radioisotopes and Biology

Dynamic Clinical Studies with Radioisotopes. Proceedings of a symposium held at Oak Ridge, Tennessee, in October 1963. Ralph M. Knisely, W. Newlon Tauxe, and Elizabeth B. Anderson, Eds. U.S. Atomic Energy Commission, Washington, D.C., 1964 (order from U.S. Department of Commerce, Washington, D.C.). vi + 634 pp. Illus. Paper, $4.50.

Here is a paperback that no biology laboratory can afford to be without. And in "biology" I would include all applied human biology (that is, medicine, surgery, pediatrics, and the like) centers as well as preclinical departments and research foundations.

This book is a remarkable one, bringing together the data, interpretation, comments, and discussions relative to an important and emerging new field—clinical data based on isotope kinetics. It is a fit successor to the previous publications of Oak Ridge symposia, the most recent predecessor being the proceedings of the 1962

Symposium on Medical Radioisotope Scanning.

The measurement of influx, efflux, appearance, disappearance, and circulation rates by isotope kinetics is not new. Indeed such concepts antedate the application of isotopes and find their ancestors in such time-honored clinical curves as glucose tolerance tests and glomerular filtration rates. The added dimension that justifies the symposium, and makes the book so important, is the development of new instrumentation and more sophisticated mathematical analysis which make the short-term coordinates significant. Measurements, formerly documented on the basis of minutes, hours, or days, to study disappearance curves, biological turnover rates, and the like, can now be recorded in terms of seconds to yield critical information about events that occur rapidly in the living organism, events that are difficult or impossible to analyze in any other way.

Metabolic studies of body components and physiologic events—for example, blood flow, organ flow, gas flow, cardiac output, liver function, kidney function, albumin synthesis and degradation, and turnover rates for such metallo-ions as calcium, magnesium, and copper—can now be quantified readily. Many of these techniques are brought together in this volume.

What, then, can one find to criticize in such a fine contribution? First, there is the criticism that is intrinsic in any type of symposium in the isotope field. When national symposiums on isotope applications were first held, about 1940, it was immediately evident that the isotopes were the tools, but that the physiological and biological variables did not provide a common ground for discussion. Should the symposium be on "isotopes" or on "the liver"? Does the common use of a laboratory device justify the cohabitation of studies relating to so many different organ systems and synthetic pathways? Possibly the next symposium at Oak Ridge will concentrate on one or two organ systems or biological parameters, rather than on the tools themselves, despite the fact that Oak Ridge must necessarily be identified with the isotopic tracer techniques rather than with the biological processes being studied. One cannot escape the conclusion that the biological problem is more important, more challenging, and more difficult than is the radioisotope application itself.

The most disturbing thing to the reader, however, is the wide variety of mathematical terms used. The mathematical models employed are not very numerous. There are only a limited number of kinetic situations that demand analysis. It would be a great service to workers in this field if the differential equations derived for these applications could be expressed using common terms and standard nomenclature. One could then derive a standard set of equations that would cover most of the situations encountered.

As a minor criticism, one would hope that at another symposium more consideration would be given to water kinetics as revealed by deuterium or tritium curves—one of the earliest applications in this field and still one of the most important.

Looking back over the volume, I consider it unlikely that any single reviewer, surely not this one, could speak with authority on all the biological problems and organ systems involved. One can only pluck from the volume those derivations, computer applications, and isotope measurements that are important and applicable in his own field. And for such a use, this volume truly has no competitor.

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Operational Procedures

Generalized Functions and Direct Operational Methods. vol. 1, *Non-Analytic Generalized Functions in One Dimension.* T. P. G. Liverman. Prentice-Hall, Englewood Cliffs, N.J., 1964. xiv + 338 pp. Illus. $14.

One suspects that generalized functions were invented to make an honest woman of the Dirac delta function, which mathematicians have tended to look upon as one of the physicists' little sins. The present volume provides them with an opportunity to sin no more. As might be expected the incumberances attendant upon the legitimatizing process make the Dirac delta function lose some of its racy appeal. The generalized function theory impinges upon several conventional mathematical disciplines, such as differential equations, the Laplace transform, and Fourier series. As with all operational procedures there is a moot economic question, important to the student, "does what it accomplishes justify the time spent in learning it, when compared with the conventional methods?"

If the student elects to proceed he will find this book extremely well written by a man with a flair for English composition unusual among mathematicians. On page 209 one finds the following comment, "A certain brevity of treatment is achieved here at the reader's expense: by unloading most of the proofs required into the exercise hopper." Pleasant tidbits like this are to be found throughout the book.

The generalized function is defined in terms of a linear functional which may, in turn, be expressed in terms of an inner product. As a specific illustration, suppose that instead of a function $f(t)$ we treat the "smoothed" function $\int_a^b f(t)\phi(t)\mathrm{d}t$, where $\phi(t)$ is infinitely differentiable. Then many of the operations that would have been performed on $f(t)$ can be transferred, by integration by parts, to $\phi(t)$ which may be much more able to take them. By this device the generalized function theory can, for instance, make sensible definitions of the Dirac delta function and its derivatives.

There is, happily, chapter 0, "Introductory, heuristic background."

Chapters 1 and 2 are devoted to developing the calculus of the generalized functions. Chapters 3 and 4 are devoted to its application to differential equations with constant coefficients and systems of differential equations, plus a few applications to such topics as integro-differential equations and linear difference equations. Chapters 5 and 6 penetrate more deeply into generalized function theory. The Laplace transform, with applications, is studied in chapter 7 and Fourier series in chapter 8.

The book is written as a textbook, but would serve very well as a reference source. Its mathematics is within the range of upper division undergraduates and graduate students, although some of the former may lack the experience to grasp the motivation in places.

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