Book Reviews

The Presentation of Technical Information. Reginald O. Kapp. Macmillan, New York, 1957 (published in Great Britain, 1948). 147 pp. $1.95.

Among the peculiarities of modern man to which psychologists have given all too little attention are the pride of the intellectual in avoiding physical exercise, the pride of the man in the street in avoiding mathematics, and the pride of the expert in avoiding plain talk. The last of these three interesting phenomena is the concern of this little book on writing. The author is an Englishman, reminding us that murder of the King's English is as common in England as in the United States. His book is based on a course in exposition given for postgraduate students of engineering at University College, London. What makes it outstanding among such courses and books is that it not only has many helpful things to say about the mechanics of writing but also goes to the heart of the scientist's and engineer's problem of communication.

Reginald Kapp starts from the unarguable fact that communication of scientific work nowadays is virtually as important as the work itself. The scientist's day "is crowded with talks, conferences, committees." He must report what he is doing to his colleagues, to team mates from other sciences, to his sponsors, often to industry or the public at large. Unfortunately, there is no royal road to communication, any more than to the solution of a scientific problem. Successful communication is hard work. All too often the writers of scientific papers leave all the work to the reader—"to put into the right order in his mind what is in the wrong order in the paper, to draw the conclusions he is meant to even when they are not stated, to jump without any guidance to the significance of a statement, to bridge any gap the author's carelessness may have left in a line of reasoning."

Of course, no reader is going to do all this work except under extreme necessity. "He gives his attention only to those who know how to earn it and hold it. So those scientists and philosophers who neglect the problems of presentation should ponder on the fate of all tyrants in history. If they argue that these problems are too insignificant for their exalted study, if they plead that their time is valuable, they should reflect that the time of the person addressed is valuable too. If he can help it, this person will not waste his time quarrying [to dig out the ore]. In the end, the proud scientist or philosopher who cannot be bothered to make his thought accessible has no choice but to retire to the heights in which dwell the Great Misunderstood and the Great Ignored, there to rail in Olympic superiority at the folly of mankind."

What Kapp has to say applies to the communication between one scientist and another as well as between scientists and the larger public. Basically, the defects of most scientific writing in our day are logical and psychological: failure of the author (i) to present his thought lucidly and (ii) to consider the person he is addressing. This is not to overlook the fact that important contributions to the unreadability of much scientific writing are made by unnecessary impediments of pretentious language, clumsy sentence structure, and so forth. But good writing is more than a matter of simple language and accurate grammar, important as these are. It calls for clear, logical, and orderly development of the author's thesis. The account should be related to the reader's knowledge and understanding and must provide him with a map which "helps him to know from moment to moment where he is, how he got there, and in which direction his path lies." Kapp's book sets forth some specific and sensible precepts on how to achieve that kind of writing.

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Handbuch der Laplace-Transformation. vol. III, *Anwendungen der Laplace-Transformation.* Gustav Doetsch. Birkhäuser, Basel, 1956. 300 pp. Illus.

Anwendungen der Laplace-Transformation, by one of the outstanding European mathematicians, is the third of a trilogy comprising an inclusive account of the theory and application of the Laplace transform. The first volume, *Theorie der Laplace-Transformation* (1950), encompasses an inclusive treatment of the "pure" mathematical theory of the Laplace transform. The second volume, *Anwendungen der Laplace-Transformation* (1955) and the present third volume comprise, *in toto,* a unified account of that further body of theory which is particularly pertinent to solution of problems in engineering, physics, and applied mathematics and illustration of its use by numerous examples in these domains.

Volume II includes asymptotic representations, convergent representations, and solution of ordinary differential equations by Laplace transform techniques; each of these major topics forms one of the three major parts of the book. The present volume III encompasses a detailed treatment of the solution of partial differential equations, difference equations, and integral equations by Laplace transform means and a complementary account of entire functions of exponential type and of finite Laplace transforms. Each phase constitutes one of the four major divisions of the text. Unification of the two volumes into a single connected work is accomplished by continuing, from volume II through volume III, the numbering of the major subdivisions of the text (volume II: parts I–III; volume III: parts IV–VII) and of the chapter headings (volume II: chapters 1–16; volume III: chapters 17–32). Obviously, therefore, anyone who has volume II will want to obtain the complementary volume III.

This is divided into four major sections. The essential content, range of treatment, grouping of material, and relative stress on different topics is well epitomized in the following summary which includes free translation of the 16 chapter headings, pertinent inclusive page numbers, and brief accounts of the principal purpose that underlies the treatment of each section.

Part IV, "Partial differential equations," embraces five chapters: "Generalities concerning partial differential equations and their integration by means of Laplace-transforms" (pages 13–21); "Partial differential equations of the second order with constant coefficients" (pages 22–61); "Partial differential equations with variable coefficients" (pages 62–69); "Uniqueness theorems and compatibility conditions for boundary and initial conditions" (pages 70–78); and "Huygen's and Euler's principles" (pages 79–88).

These chapters comprise an excellent account of the single Laplace transform solution of partial differential equations in two variables with constant and, more briefly, certain types of variable coefficients under prescribed conjoined initial and boundary conditions. They

detail the particular pitfalls and delicacies that attend legitimate encompassment of certain kinds of prescribed conditions, and conclude with a concise account of the connection between solution of a problem by Laplace transforms and by functional analysis through the common denominator of the role of the pertinent Green's function. Illustration of application of this theory is drawn largely from well-known problems in the two domains of heat flow in thermally conducting planar areas and of voltage and current propagation in electric transmission lines.

Part V, "Difference equations," includes three short chapters: "Ordinary difference equations in the original domain" (pages 91–106); "Ordinary difference equations in the transform domain" (pages 107–115); and "Partial difference equations" (pages 116–130). This division of content advances the basic theory that underlies transform solution of ordinary difference and difference-differential equations in one ordinary variable (for example, t) and application to determination of current response in resistive ladder networks; the solution of ordinary and difference-differential equations in the Laplace variables, with exemplification through the classic functional equation of the gamma function; and solution of partial differential and difference-differential equations in the original domain, with the subtler details underscored through solution of two problems in planar heat conduction.

Part VI, "Integral equations and integral relationships," comprises six substantial chapters: "Integral equations of real convolution type in the finite interval" (pages 133–171); "Integral equations of real convolution type in the infinite interval" (pages 172–186); "Functional relations among real convolution integrals, especially transcendental addition theorems" (pages 187–198); "Integral equations of complex convolution type" (pages 199–208); "Correspondences between complex convolution integrals of transform functions and products of their original inverse functions" (pages 209–214); and "Various types of integral equations solvable by use of Laplace transforms (pages 215–221).

These chapters comprise a thorough exploration of the basic theory pertinent to solution of the Volterra-type equation in which the kernel depends only on $(t-\tau)$; thus, with kernel, $K(t-\tau)$. In such an equation the encompassed integral comprises a convolution transform, and this fact affords a very desirable conciseness and unification of theory of solution through the use of earlier developed Laplace transform theory. Thus, solution of linear integral equations of the first and second kind, to which one-sided and two-sided Laplace transforms are respectively pertinent, is detailed and illustrated by consideration of such familiar examples as Abel's integral equation. Next, inversion of products of transforms with parameters that satisfy the algebraic addition theorem is shown to be easily accomplished by use of the pertinent transcendental addition theorem. This is supported by numerous examples that involve the theta, Bessel, and hypergeometric functions, the Hermite and Laguerre polynomials, and other entities of the transcendental realm of functional analysis. Next, a somewhat analogous body of work is advanced for integral equations in which the independent variable is the transform variable s. The concluding chapter of this section illustrates, through specific examples, other equations, of various types, whose solution is facilitated by Laplace transform techniques; these include equations that can be transformed into equations of known solution, with kernels whose Laplace transforms are exponential functions, with kernels that are involutional in nature, and so forth.

The final part VII, "Entire functions of exponential type and finite Laplace transforms," includes two short chapters: "The finite Laplace-transform" (pages 225–232) and "Entire functions of exponential type" (pages 233–254). Essentially, these give, in detail, basic theory of existence, inversion, and so on of finite transforms of both classes I and II and illustration of use to obtain the mean-squared-value of functions of exponential type and to investigate certain relationships on its derivatives.

The main text is supported by a "Foreword"; short "Connective remarks"; a "Table of contents"; "Addenda to volume I" (pages 253–259); a lengthy "Literatureal and historical commentary" (pages 261–276) that gives illuminating critical comment and historical data pertinent to various points in the text; a list of "Books" that are especially concerned with applications of Laplace transforms (it may be of value to note, for the benefit of the interested reader, that during the past decade I have been able to purchase all of the 24 items that are listed, with the exception of those by Droste and Schulz, stocks of which were evidently destroyed in Berlin during World War II); a lengthy "Bibliography" (pages 279–286) of periodical articles and books, arranged alphabetically by author; a "Subject index"; a list of "Amendations to Volume II"; and a listing of the major division headings of volumes I and II.

In physical aspect this volume is of the same excellence as are the earlier volumes. It has glossy paper of high quality, stout board covers in an attractive green cloth binding, superlative typography, nicely displayed equations, detailed line drawings, and a convenient page size. The textual content is couched in a lucid style that materially aids the reader to grasp the theoretical developments and supporting illustrative examples. The accuracy of theory, precision of statement, and detail of treatment are evidence of the breadth of knowledge, originality, and command of application that stamp the author as one of the foremost European mathematicians in the domain of Laplace transform analysis.

This volume, like its predecessors, will of course prove to be of greatest interest to mathematicians, particularly to those concerned with analysis and applied mathematics. However, because of the power, utility, and rapidly increasing use of integral transforms—especially of Laplace transforms—for the solution of specified problems or the development of general theory in all branches of present-day physics, chemistry, and celestial mechanics and in every domain of engineering and associated technologies (especially in such difficult phases as variable-media wave-propagation theory and nonlinear system analysis, where integral equation formulations provide especially fruitful means of solution), this volume deserves close study and assimilation by all physical scientists and engineers who wish to keep abreast of those developments in mathematical analysis which underlie the analytic foundations of their own domains of professional endeavor.

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Laboratory Engineering. vol. III, pt. II of *Technique of Organic Chemistry.* Arnold Weissberger, Ed. Interscience, New York, ed. 2, 1957. 391 pp. Illus. $8.

The first edition of *Laboratory Engineering* treated the general engineering aspects of operations used in preparative organic chemistry. In the new second edition, the volume has been split into two parts. The first part deals with separational methods, while part II is concerned with the engineering type of problems commonly encountered in the chemical laboratory.

The book is divided into five sections. Two of the sections on "Mixing" and "Heating and cooling" have been updated from the first edition, while the other three sections, "Operations with gases," "Selection of materials for the construction of equipment," and "Grinding, screening, and classifying," are completely new. All of the sections emphasize applications of equipment and engineering methods in the laboratory or in small-scale plants. The purpose of the