occurs in the earlier chapters. This lack of precision is also too evident to avoid comment in parts of the chapter on thermodynamics. For example, $p\delta V$ [*sic*] is only the work done in an infinitesimal expansion of the system when that work is done reversibly.

Thus far the criticisms are of a comparatively minor nature. It is when one comes to the chapters on shock and continuum hydrodynamics that the important deficiencies occur. At best these parts of the book are amateurish, at worst downright incorrect. Most especially I refer to the section on sound waves, where a particular solution of the inhomogeneous wave equation is derived on the basis of a gross confusion between what are commonly known as 'body forces' and the forces actually experienced by a body immersed in a continuum supersonic stream. The distinction between them is known to every undergraduate who has anything to do with fluid mechanics and the appearance of such an error in any text-book is unforgivable. To summarize, the present book can be read with profit for its atomic theory but can hardly be recommended for its gas dynamics. JOHN F. CLARKE

SOVIET OPERATIONAL CALCULUS

Integral Transforms and Operational Calculus

By V. A. Ditkin and A. P. Prudnikov. Translated by D. E. Brown. English translation edited by Ian N. Sneddon. (International Series of Monographs in Pure and Applied Mathematics, Vol. 78.) Pp. xi + 529. (London and New York: Pergamon Press, Ltd., 1965.) 100*s*. net.

INTEGRAL transforms, as a technique for solving differential equations, are a familiar part of the education of every mathematician. The technique is only really effective for some amenable linear differential and integral equations and provided that the space-time boundary conditions of the problem are sufficiently specialized. It is not viewed with great favour by modern pure mathematicians, as it aims at producing results rather than understanding. Yet, despite these manifest limitations, it will always be studied and books about it will continue to be written, because it rapidly and elegantly yields formulae of basic importance throughout the whole of linear physics and engineering. Indeed, its theoretical foundations have recently been the object of intense study by Russian mathematicians. Operational calculus was developed systematically in the middle of the nineteenth century, and then successfully applied by Oliver Heaviside to the solution of various problems arising from electromagnetic oscillation theory. Heaviside's point of view was afterwards displaced by the integral transform methods of Bromwich (not mentioned in this book) and others. Now the wheel has turned full cycle, and, as the authors point out in their foreword, "A complete return to the original operator view-point was made by Mikusinskii. He has provided a strict operator basis for Heaviside's operational calculus without any reference to the theory of the Laplace transform. When describing his theory, it occurred to Mikusinskii to introduce different notations for a function and for its value at a given point. For instance, 2 is the number, while {2} is the function taking the constant value 2.

"The definition of convolution given in Chapter V differs from that of Mikusinskii in that there is no need to distinguish between constants and functions of a constant. Since the various transformations and calculations connected with finding the operational formulae are considerably simplified in a number of cases when the Laplace integral is used, an indication is given here of the connexion between our calculus and the Laplace transform."

This chapter, entitled "Operational Calculus", is by far the most recondite in the book, and is evidently addressed to a more exclusive audience than are the other chapters. It does, however, contain remarks on difference equations, and on differential equations with phase lag, that should be of general interest. The treatment throughout the book is fairly straightforward, though one may sometimes wonder what distinguishes a "theorem" from a "property", and why dates are mentioned in the enunciation of some theorems and not in others. Reasonable familiarity with the special functions of analysis is assumed: Bessel and Gamma functions appear without warning on page 23; Green's function appears without explanation on page 62; MacDonald's function is introduced without a definition on page 75. A number of minor errors and misprints will be spotted by the reader without difficulty.

These five chapters, taking up some 150 pages, comprise only Part I of the book. They are in effect an introduction to Part II, which is a 350-page compilation of well-classified transforms drawn up partly from existing tables and partly from the solution of concrete problems known to the authors. Most of the latter are probably unknown outside the Soviet Union. The tables are prefaced by a list of some 150 special functions encountered in the text. Russian functional symbolism is used, but differs only slightly from our own as indicated on p. 147. About 250 references are cited.

This is not a book for the beginner, or even for the amateur, but specialists should find it a mine of useful information about developments in this field.

M. A. JASWON

TECHNETIUM AND RHENIUM

The Chemistry of Technetium and Rhenium

By R. D. Peacock. (Topics in Inorganic and General Chemistry, Monograph 6.) Pp. ix + 137. (Amsterdam, London and New York: Elsevier Publishing Company, 1966.) 55*s*.

The Chemistry of Technetium and Rhenium is a fascinating example of recent developments in inorganic chemistry, and the majority of the references cited at the end of each chapter are drawn from the literature of the past 15 years. Rhenium, discovered in 1925 by Noddack by means of its characteristic X-ray spectrum, is widely dispersed in nature and this factor undoubtedly delayed its discovery and impeded the study of its chemistry. In 1937 Perrier and Segre produced a radioactive isotope of element No. 43 by deuteron bombardment of molybdenum and appropriately named the element technetium. Earlier attempts to discover "primordial" technetium were thwarted by the instability of all its isotopes, although "natural" technetium-99, generated by spontaneous fission of uranium, has recently been detected. The development of large-scale nuclear reactors has produced reasonable quantities of technetium-99 as a by-product and has accordingly stimulated the investigation of the chemistry of this element.

Technetium and rhenium are transition elements *par excellence*, and show oxidation states from 0 to 7 and co-ordination numbers from 4 to 7 with a wide variety of ligands including fluoride, nitride, hydride, π-*cyclo*-pentadienyl, acetylacetonate, diarsine, triphenylphosphine oxide, cyanide and carbonyl, not forgetting some fascinating polynuclear chlorides containing metal–metal bonds.

Prof. Peacock has done justice to this interesting field with a concisely written monograph which is a mine of information and interesting to read. Following the two opening chapters on the discovery and isolation of the elements and their general and elementary properties, the descriptive chemistry of these elements is dealt with in a series of chapters on oxides, halides, cyanides, etc., and the final chapter summarizes analytical methods. For good measure there are appendixes on the laboratory handling of technetium, bibliography and further references. This method of organization seems successful,