1967. Chapter 5, "Cooling with Helium-3," is the principal subject material that was not included in the first edition; several other additions to particular chapters were both appropriate and included.

White's insertion of actual calculations (involving design problems that are frequently encountered) as a basis for constructing cryogenic experimental apparatus is undoubtedly of great assistance to the experimentalist who may be relatively inexperienced in fundamental cryogenic design.

My particular speciality in cryogenics is temperature measurement (chapter 4), and I compliment White's treatment of the subject. The chapter is intentionally mentioned in this review to call the prospective reader's attention to a new "International Practical Temperature Scale (1968)" that exists and will shortly be in use. It extends down to 13.8 K and employs the platinum-resistance thermometer as an interpolating instrument in its lower range. The thermometry "fixed" points below 90 K (chapter 4, table 8) require slight modifications and the experimentalist who is concerned with the most accurate determination of temperature should refer to forthcoming publications, for example *Metrologia*, April 1969, for the definition of IPTS-68 (PHYSICS TODAY, July, page 71). This information was not available to White before the second edition was in press but he makes a note that presages such a scale.

White has accomplished his primary purpose in writing the book, and I heartily commend it to the experimentalist who finds himself involved in cryogenic techniques. I do suggest, if a third edition is produced, that it include a chapter in the general category of electrical instrumentation and measurements below 4 K—perhaps cryoelectronics would be a more descriptive expression.

* * *

Harmon H. Plumb, chief of the Temperature Section, National Bureau of Standards, has been involved in cryogenic experimentation for 17 years.

Classical–modern synthesis

MATHEMATICAL PHYSICS. By Eugene Butkov. 735 pp. Addison-Wesley, Reading, Mass., 1968. $17.50

by GARRISON SPOSITO

The most recent textbooks on mathematical physics have tended to fall rather distinctly into one of two categories. Either they are reverent descendants of the classic tome by E. T. Whitaker and G. N. Watson or they pay homage to the new pantheon erected in the name of functional analysis. To one group the Sturm–Liouville problem suggests a differential equation whose worthwhile solutions are special blends of certain kinds of polynomial and convergence factors, but to the other the problem brings to mind a Hermitian operator that generates a basis in a Hilbert space.

It is not surprising that the disparity of language between these two approaches should have partitioned the mathematical audience in physics. What is surprising is that anyone might attempt a synthesis of the two. But this is just what Eugene Butkov, a professor at St John's University, has done in *Mathematical Physics*.

The book comprises 16 rather long chapters that automatically present to anyone who would teach from it the possibility of an eclectic choice of subject matter. On the classic side, there are chapters on complex variables, differential equations (including Green's functions), Fourier transforms and certain orthogonal functions. On the side of soft analysis are chapters on the theory of distributions and on linear spaces of arbitrary dimension. The latter, however, are not isolated from their companion chapters in any way. Rather they are introduced and developed in the vernacular of the classical paradigm. For example the theory of distributions is brought in through a discussion of impulsive forces and switching processes and is described in terms of weakly convergent sequences of admissible functions, with no mention of linear functionals on the space $D(\Omega)$.

Undoubtedly this kind of linguistic perturbation is the best way to bridge the mathematical generation gap. Moreover the idea of permitting physical problems to suggest the mathematics—a notion that is adhered to in

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many of the chapters—is excellent. When one adds these positive attributes to the manifold remarks and explanatory footnotes that accompany the text, he concludes that Butkov has written an eminently teachable and useful textbook.

It is certainly the book for the nontheorist professional who needs a readable but careful compendium of the most important mathematics relevant to physics. It is also the book for a course on mathematical physics.

* * *

Garrison Sposito is an associate professor of physics at Sonoma State College, Rohnert Park, California.

Money and efficiency

GOVERNMENT CONTRACTING AND TECHNOLOGICAL CHANGE. By Clarence H. Danhof. 472 pp. The Brooking Institution, Washington, D. C., 1968. $8.75

by JOSEPH AGASSI

Despite obvious merit and usefulness, this volume is disappointing. Clarence Danhof was assigned the objective of examining government-sponsored research in various ways. His historical-background portion is the shortest and best: The unpreparedness for World War II and the atomic spectacular led to legislation against stint but not against waste. The investment developed chiefly as contracts to avoid the possibility of putting too much responsibility—and blame—on any given official.

The present organizational details are piled up, catalog wise, and with no perspective. There is a quote (pages 97, 98) of a long discussion on Parkinson's first law (work expands to cover time allotted to it) in the pseudoscientific language of scientific bureaucrats worthy of any parodist. Parkinson's second law (time spent in committee on budget items varies inversely to their magnitude) is not quoted, but exemplified in various instances, particularly relating to the impact of the legislature (pages 205, 216), that controlled only a minute fraction of the expenditure. The author was also assigned to evaluate the impact of government-sponsored research and its broad implications. On the impact he makes a few cautious and well known observations and on the broad implications nothing at all. He hardly even discusses the roles of scientific agencies and societies.

But within its limits this is a good compilation, readable, competent, detailed, accurate and useful even though largely out of date. No lobbyist or scientific adviser can afford to overlook it. But it is already out of date as shown by reëvaluations made with the change of administration, especially on the armed forces and their role and on the office of scientific adviser to the President. Even before the changeover, the squeeze had rendered obsolete much of this book and its mood.

The general lessons from this volume are rather platitudinous. On the whole the project of government-sponsored research is a magnificent success in spite of some—even many and systematic—terrible howlers. No one knows how to assign priorities and how to prevent conservatism and repetition of some blunders. But much obviously can be done to improve matters, if we only knew how to bring about the implementation of our good counsels.

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A professor in the philosophy department at Boston University, the reviewer specializes in scientific methods and the philosophy of physics.

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