Institute of Atmospheric Physics, University of Arizona, deals with the physics of cloud modification. This chapter again is of great current interest. The author reviews the present status of our understanding of the physical processes involved in condensation and precipitation, and then discusses developments in cloud modification techniques using artificial nucleation—the so-called "seeding" technique. The author then evaluates the modification experiments, but the conclusion is not a firm one and this reviewer is not left with a very strong feeling concerning the value of the modification experiments.

Differentialgleichungen der Physik. By Fritz Sauter. 147 pp. Walter de Gruyter & Co., Berlin, Germany, 1958. Paperbound DM 2.40. *Reviewed by C. M. Ablow, Stanford Research Institute.*

Methods of solution of the differential equations arising from the conservation laws of physics are usually presented in a disjointed manner, each type of equation yielding to its peculiar solution trick.

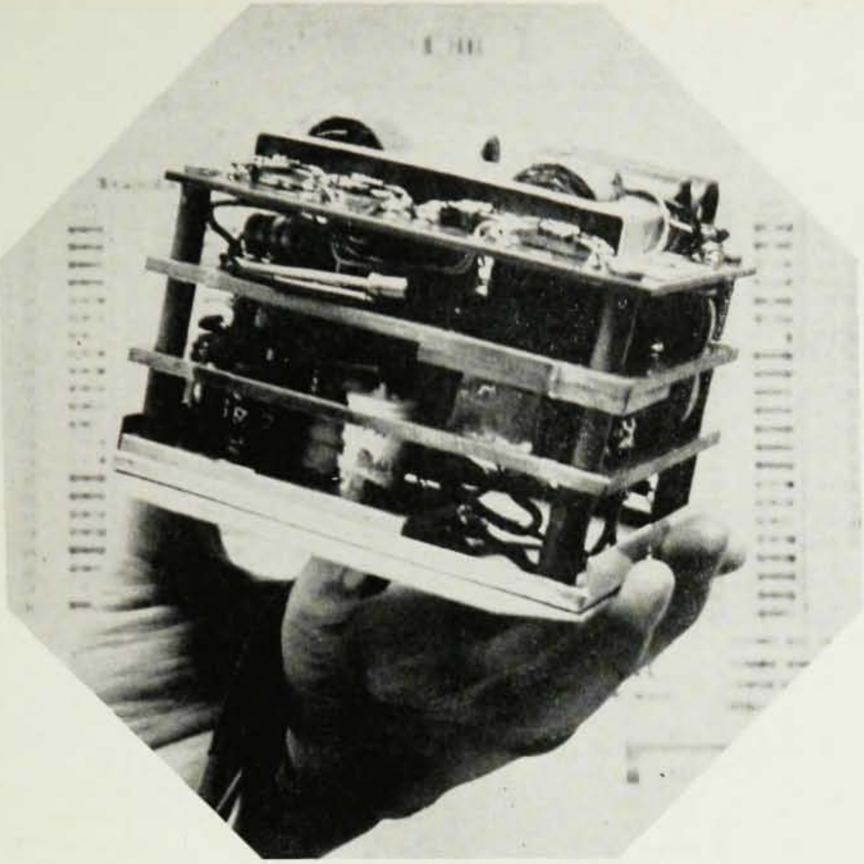
In this little book the methods are shown to arise naturally from the mathematical expression of physical properties described by the equation. For example, if the "spring constant" of a harmonic oscillator varies symmetrically about the equilibrium point it is the frequency of the oscillator which is affected, while if that variation is not symmetrical the equilibrium point itself is moved. These physical considerations dictate in a natural way forms for approximate solution of the equations of different nonharmonic oscillators.

The author goes surprisingly far without asking from his readers more than the elements of calculus and of manipulations with series. A few of the ordinary differential equations of mechanics are discussed. More space is given to the partial differential wave, heat, and potential equations. Several of the more useful orthogonal function systems, such as the Legendre, Laguerre, and Hermite polynomials, are introduced in a physically rational manner. Both exact methods for typical equations and approximate methods for equations of similar form are presented.

The book is written in the simplest and therefore best scientific German with few if any of those long and intricate sentences which are, by those inexpert with languages, so understandably dreaded.

Fluid Dynamics and Heat Transfer. By James G. Knudsen and Donald L. Katz. 576 pp. McGraw-Hill Book Co., Inc., New York, 1958. $12.50. *Reviewed by Robert E. Street, University of Washington.*

There are textbooks on fluid dynamics and textbooks on heat transfer. The first usually include some material on heat transfer and the second invariably contains a chapter or two on fluid flow. From the physical point of view there is really no distinction, since the flow problem is one of the transport of momentum and the other is one of the transport of energy; any flow prob-



The most serious of facts

• "Power when wielded by abnormal energy is the most serious of facts," wrote Henry Adams in *The Dynamo and the Virgin.* One serious fact is the birth of the handful of power above: the early form of a transistor regulated power supply, developed by *tech/ops*, now in production, in sophisticated forms by *tech/ops*' subsidiary, Power Sources, Incorporated.

Best suited for arduous requirements in applications demanding reliability under extreme operating conditions which force rejection of conventional power supply circuitry (such as guided missiles and other military space needs), this handful of power is also presently being used in television stations, as in a host of other applications.

And it is another typical example of *tech/ops*' product capability and broad scientific research and development for business, industry, and government.

personnel requirements

at **Fort Monroe, Virginia, or Burlington, Massachusetts: Operations Analysts** experienced in industrial or military operations research, systems analysis, weapons systems evaluation, computer techniques, or related fields; training should be in mathematics or physical sciences, preferably on graduate level.

at **Washington, D. C.: Programmers** with substantial experience in the development of large digital computer programs, background should include experience with design and application of assembly programs, compilers, and advanced programming concepts.

at **Monterey, California: Communications** engineer or physicist thoroughly familiar with the principles of radio transmission and communications network analysis.

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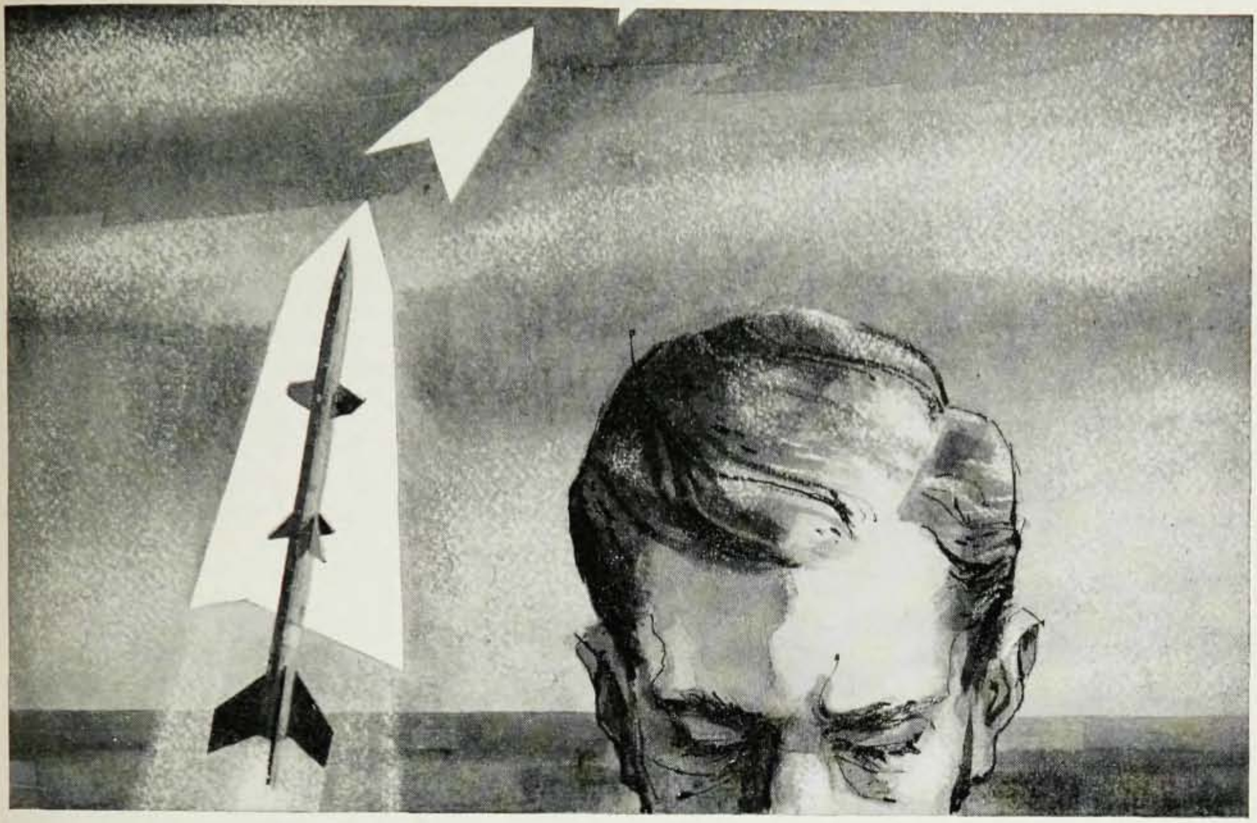
lem must consider the effects of both transport phenomena if it treats either one. This new textbook for graduate students of chemical engineering is probably the first one to present both subjects from a unified point of view.

The book is certainly not of interest alone to students of chemical engineering. The subject matter is basic for all engineers and applied physicists and is now considered essential in all engineering curricula, even on the undergraduate level. Naturally, many subjects of great interest had to be left out, in order to keep the size within reason. By concerning itself with those aspects of heat transfer closest to the flow phenomena, only forced convection heat transfer is included; conduction, radiation, and free convection are omitted or barely mentioned. Furthermore, only the flow of incompressible fluids is included; although this is disappointing, it does simplify and helps to emphasize the fundamentals of the subject. Actually a student or teacher, whose main interest is in compressible flow problems, must know the incompressible case thoroughly, since many of the compressible problems become tractable only by reducing them to a related incompressible problem.

The book is logically divided into three parts. Part 1, Basic Equations and Flow of Nonviscous Fluids contains three chapters. Chapter 1 is a general discussion of fluids and their properties. Chapter 2 derives the differential equations of fluid flow. Some of the derivations are sketchy but there is a fine sense of balance between too much and too little detail. There are good references to more detailed derivations. Chapter 3 on nonviscous fluids could probably have been left out. However, it does not take up much space, and for the student who may not have had an earlier course in the flow of nonviscous fluids it does present, although sketchily, methods of solution of a few classical problems in contrast to the entirely different approach to viscous flow problems which constitutes the content of the remainder of the book.

Part 2, The Flow of Viscous Fluids, is the longest part and is composed of eight chapters as follows. Chapter 4 treats some of the exact solutions for laminar flow in closed conduits of constant cross section. Chapter 5 is an introduction to turbulence and methods for its measurement with emphasis upon the modern statistical theory. This is the last one hears of the modern methods, since in the remainder of the book, use is made only of Prandtl's mixing length theory and the classical velocity profiles of Blasins, Prandtl, von Karman, et al., with the laminar sublayer, etc. Chapter 6 uses dimensional analysis to derive all of the well-known dimensionless groups so useful in fluid flow. Chapter 7 is a long one on the turbulent flow in closed conduits, Chapter 8 treats the laminar sublayer, and Chapter 9 is on flow in the entrance section of conduits which involves the problem of formation of a boundary layer and its transition into a fully developed velocity profile, laminar and turbulent. Chapter 10 is another long one on the laminar and turbulent flow past



two- and three-dimensional bodies. Von Karman's integral momentum equation is introduced and used here. Finally Chapter 11 completes this part on flows by considering the flow past banks of tubes which are typical of the ones used in heat exchangers.

Part 3, Convection Heat Transfer, concludes the book with the chapters on heat transfer. Chapter 12 introduces the main concepts together with the dimensionless parameters of the subject. Chapters 13 and 14 are concerned with laminar and turbulent flow heat transfer in closed conduits, respectively. Chapter 15 is an excellent one on the analogy between momentum and heat transfer with all of the better-known incompressible modifications. Chapter 16 on heat transfer with liquid metals is timely because of the importance of this subject in the design of nuclear reactors. Finally Chapter 17 concludes with a study of the heat transfer to immersed bodies, including the flat plate, the circular cylinder, spheres, and banks of tubes.

The book is a pleasure to read and the format is excellent. The diagrams are clear, and well-chosen graphs serve to compare experimental data with theory. Many illustrative problems indicate the methods of solution and another large collection of unworked problems is included at the end. A complete table of nomenclature in the appendix is a useful feature as well. The authors have performed a real service by producing a text as good as this one is, covering a field which encompasses two classically distinct subjects.

Nuclear Instrumentation II. Vol. 45 of Handbuch der Physik. Edited by S. Flügge and E. Creutz. 544 pp. Springer-Verlag, Berlin, Germany, 1958. DM 128.00 (subscription price DM 102.40). *Reviewed by Kamal K. Seth, Duke University.*

This volume of the *Handbuch* is concerned with particle and quanta detection and contains the following articles: 1. Ionization Chambers (H. W. Fulbright) 50 pp., 2. Geiger Counters (S. A. Korff) 35 pp., 3. Scintillation and Čerenkov Counters (W. E. Mott and R. E. Sutton) 84 pp., 4. Proportional Counters (S. C. Curran) 46 pp., 5. Coincidence Methods (S. de Benedetti and D. E. Findley) 27 pp., 6. Cloud Chambers (C. M. York) 53 pp., 7. Bubble Chambers (D. A. Glaser) 21 pp., 8. Nuclear Emulsions (M. M. Shapiro) 93 pp., 9. Detection of Neutrons (H. H. Barschall) 50 pp., 10. High Energy Neutron Detectors (R. T. Siegel) 30 pp.

The authors are recognized authorities on their subjects; the number of pages devoted to each article is therefore a rough measure of the extent to which the authors have gone into detailed considerations. However, individual styles differ and therefore deserve brief comment.

Fulbright's article on ionization chambers is detailed and well written, and contains an illuminating discussion of the mechanics of primary ionization and subsequent drifts. Korff has hardly anything new to say about Geiger counters. His article is at best a meager summary of some chapters from his well-known book