hydroballistics, with emphasis on current and recent techniques.

Two articles, "Statistical hydrodynamics in porous media," by Adrian E. Scheidegger, and "Hydraulics of wells," by Mahdi S. Hantush, are concerned with the flow of fluids through porous media. These articles are not descriptive, elementary texts but advanced treatises and decidedly mathematical expositions. Their highly mathematical flavor makes these chapters difficult to understand, but they provide valuable insight into the intricacies of groundwater flow.

It is difficult to deduce Darcy's law from the fundamental laws of hydrodynamics, such as the Navier-Stokes equations, because it is impossible to give a complete description of the geometry of the pore system of a porous medium. Scheidegger's article is concerned with an approach that faces the difficulties head on by treating various phenomena only on a statistical basis.

Hantush, in a most important contribution to the field of hydraulics of water wells, covers basic principles and fundamental equations pertaining to the steady- and unsteady-state flow of water in aquifers. Definitions and useful approximations for several functions that are commonly encountered in well problems and in other groundwater flow problems are given. Drawdown and yield formulas are presented for steady- or constant-discharge nonflowing and flowing wells and collector wells in various aquifer systems.

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Problems in Space Science

Unusual Environments and Human Behavior. Physiological and psychological problems of man in space. Neal M. Burns, Randall M. Chambers, and Edwin Hendler, Eds. Free Press (Macmillan), New York, 1963. x + 438 pp. Illus. $9.95.

This introductory text, which attempts to present a concise review of current knowledge about the physiological and psychological problems that man will encounter in the space environment, is divided into two sections, (i) Overviews, and (ii) Specific Problem Areas. In the first, the authors discuss general concepts of human reactions to stress and attempt to derive objective standards of measurement. Relevant experience gained from nonspace stress situations is then presented. In the second part, the environmental stresses anticipated in space flight are treated individually. The chapters, written by 16 specialists in the field, are entitled: "The physiological effects of unusual environments"; "Psychological and psychophysiological indices of stress"; "Computer simulation of man-machine systems"; "Psychological problems of prolonged marine submergence"; "Psychophysiology of high-altitude experience"; "Isolation and sensory deprivation"; "Operator performance in acceleration environments"; "Temperature effects on operator performance"; "Weightlessness"; "Vibration"; "The effects of radiation on integrated behavior"; and "The decade ahead."

The chapter on the effects of acceleration stress on performance is of particular interest in that Chambers discusses observations on Project Mercury astronauts and others who underwent similar stress conditions in high-altitude planes and the human centrifuge. The final chapter, written by the three editors, shows balance and insight in its evaluation of needed research in the field and of the changing concepts in scientific experimentation that are reflected, or even incurred, by a program where "the comfortable cushion of scientific information that traditionally separated the scientist from the engineer" (p. 422) is not available.

The great gaps in our knowledge of the effects of stress on man are perhaps the most important single fact in any treatment of the subject. Not only are we ignorant of many of the varied responses and cumulative effects of single stresses, but also, as Hendler points out in the conclusion of his chapter, "Questions regarding the combined effects of many stresses on physical tolerance and performance capability remain largely unanswered at this time" (p. 349). Although these deficiencies are clearly drawn in the final chapter, they are not stressed in the body of the volume. Understandably, the known rather than the unknown is emphasized. However, there is an assurance, a definiteness, in the presentation of data which could mislead the unwary reader into assuming that a great deal more is known than is, in fact, the case, and which could cause him to accept as proven hypotheses that which further research may undo. The statement, in the last chapter, that "the editors and contributors view our current level of knowledge as meager when compared with all that remains to be known" (p. 419), is certainly an honest view of the situation at the present time. One might wish that this had been the first chapter.

In view of the complexity of the subject discussed, it is obviously not possible to explore all of its aspects in depth in this small volume. It seems fair to state that the authors have reviewed the topics which, with respect to the national space program, appear to be significant to manned space flight. The data that are presented are accurate and current. Extensive and excellent references at the end of each chapter will guide the reader to more detailed studies. The book should be useful, particularly to engineers and designers, as an introduction to an understanding of the techniques and findings of research on the effects of extreme environments on man and the known limits of man's tolerances.

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Airborne Particles

Particulate Clouds: Dusts, Smoke, and Mists. Their physics and physical chemistry and industrial and environmental aspects. H. L. Green and W. R. Lane. Van Nostrand, Princeton, N.J., ed. 2, 1964. xxii + 471 pp. Illus. Plates. $13.50.

In our daily life we are continually in intimate contact with many forms of airborne particulate matter. The suspended particles may be smoke from industrial plants, microorganisms, dust from volcanoes or outer space, salt particles from the sea, or ice crystals. The sun that shines into our rooms shows us that we are living in a cloud of particulate matter. The bluish trails of smoke behind automobiles are nothing but a suspension of very small droplets of oil in air.

What ties together these various phenomena is the character of the particulates. They are aggregates larger than molecules, but still so small that they fall very slowly. The authors have limited themselves to particles that fall with a terminal velocity less than that of a 100-μ water droplet. Within this