The final chapter deals with isotopic spin and its generalizations. It is in the theory of strong interactions that present-day elementary particle theory is faced with its greatest problems; hence, it is here that a textbook is hardest to write. The author has chosen to present many highly speculative ideas, some of which have already been made obsolete by newer developments, without making clear that the evidence for them is somewhat weaker than for Lorentz invariance, for instance. The inclusion of such material in a textbook is probably unwise. It will perhaps be impossible to write a really adequate text on the theory of elementary particles until more of the major problems of that theory have been solved.

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Atlantic Hurricanes. Gordon E. Dunn and Banner I. Miller. Louisiana State University Press, Baton Rouge, La., 1960. xx + 326 pp. Illus. $10.

The large, rotary, tropical storm known regionally as the "hurricane," "typhoon," or "tropical cyclone" has a capacity for death and destruction well known to coastal and island inhabitants of the United States, Mexico and other Central American countries, Japan, China, the Philippines, and the South Pacific and Indian oceans. As many as 300,000 people have perished in a single storm, and two storms in the United States—Diane (1955) and Donna (1960)—have each caused damage that amounted to nearly $1 billion. Their energy output borders on the fantastic: the conversion of one day's hurricane winds would supply the electrical power requirements of the United States for six months. An average hurricane produces 20 billion tons of fresh water a day, which someday may be used by thirsty and ingenious future generations.

This book, written by two members of the Weather Bureau's hurricane forecast center at Miami, Fla., contains background information and safety features which could well mean the difference between life and death for large numbers of Americans who, in recent years, have moved to ocean beaches or who have ventured forth in boats into areas vulnerable to hurricanes. Much recent progress has been made in hurricane detection, tracking, and prediction by use of weather reconnaissance aircraft, radar, hurricane "beacons," and statistical and dynamical techniques involving use of electronic computers. These developments, combined with more effective dissemination of warnings, have brought the ratio of fatalities to property damage down by a factor of 60 in the past 30 years.

A glimpse into the potential contribution of weather satellites is given by a picture of the pinwheel clouds of a tropical cyclone observed near New Zealand on 10 April 1960 by the first weather satellite, Tiros I.

The book is given sharp focus by several fascinating eyewitness accounts made by survivors, some of them professional meteorologists, of outstandingly destructive hurricanes. A brief account of normal tropical weather patterns is followed by discussion of hurricane climatology, characteristics, energy, theories of forecasting, and destructive storm tides, surges, waves, rain floods, and winds. Sections of considerable practical value are devoted to the hurricane warning system, how to prepare for hurricanes, ways to improve zoning laws and building codes, and how to survive when the storm hits. The appendixes contain a listing of hurricanes that afflicted the United States from 1653 to 1958 and a useful glossary of meteorological terms.

Of particular interest are the sections devoted to the results of recent hurricane research, particularly those stemming from the extensive field activities of the National Hurricane Research Project; this project, the largest ever devoted to the study of a single meteorological phenomenon, owes its establishment to the increased federal support which was provided after the disastrous hurricanes of 1954 and 1955. In answer to the inevitable question of hurricane control, there is a brief account of several inconclusive hurricane seeding experiments as well as an account of the formidable problems involved in counteracting such energetic atmospheric phenomena.

For the more scientifically minded, the book will not serve as an adequate substitute for the chapter on tropical storms contained in Riehl's *Tropical Meteorology* (1954) or for the section on climatology and the record of storm movement and behavior found in Tannehill's *Hurricanes* (1944). Perhaps the book's greatest shortcoming is its failure to put in specific terms the principal unresolved problems concerning hurricane structure, behavior, and movement or to show how progress in the solution of these problems could contribute to improved understanding and prediction. By and large, however, the book provides interesting reading for the layman and vital information to state and city officials, construction engineers, and others concerned with alleviating hurricane damage.

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The Search for Order. Cecil J. Schneer. The development of the major ideas in the physical sciences from the earliest times to the present. Harper, New York, 1960. xvii + 398 pp. Illus. $6.

This is one of many recent books designed to introduce science to the general reader. More than most, it succeeds in portraying science as an essential part of our cultural heritage and as a framework for modern ideas and beliefs.

Necessarily the author limits himself to a few topics, to "scientific ideas which in my opinion have had the greatest influence on the evolution of civilization." These ideas progress from the cosmology of the solar system to mechanics, thermodynamics, evolution, field theory, relativity, and quantum theory. Chemistry and geology are limited to brief chapters, biology appears only in the discussion of evolution, and stellar astronomy is hardly mentioned. No two scientists would agree completely about the wisdom of this distribution, but certainly the topics selected provide material for a coherent, colorful, many-faceted, and often exciting story. The story is told with great zest, good humor, and broad understanding. Scientific ideas are set against a background of history and philosophy which serves admirably to bring out their relevance to the development of Western civilization. The author should be commended especially for his vivid and unorthodox biographical sketches of eminent scientists—sketches accompanied by numerous apt quotations from their writings.

The major shortcoming of the book is the brevity of its treatment of the scientific ideas themselves. There is no escape from this, of course, if the historical and philosophical material is to be retained and if the book is to be held to a reasonable length. The relation of force to acceleration, the con-

cept of atomic weight, the second law of thermodynamics, the interpretation of spectra, the uncertainty principle—all traditional stumbling blocks to novices in science—are presented rapidly, nonchalantly, with practically no examples and few diagrams. The extreme condensation in places leads to statements which a nonscientist would find misleading or confusing—for example, the assertion that alkali metals "combine with oxygen in the proportion 2:1" (page 149); the picture of a molecular model with no caption other than "Structural chemistry" (page 152); the use of ocean waves as an example of simple transverse wave motion (page 246); the casual statement about "certain sharply defined frequencies . . . called line spectra" (page 349). More serious, perhaps, is the impression left by some of the brief discussions that scientists are a species of wizard, who effortlessly hit on the magical equation or the kind of experiment necessary to solve a problem.

This characteristic of the book may be a shortcoming or not, depending on the audience for which the book is intended. A reader with a modest background in elementary science could fill the gaps and resolve the ambiguities without trouble. Henry Margenau, in a foreword, expresses "a strong desire to see this sort of treatment in the hands of my physics and of my philosophy students"; and for such students, the book is admirably suited. On the other hand, the author himself maintains that "the objective of the book is to introduce the physical sciences," presumably to liberal art students like those in his own classes. It seems questionable just how clear a conception of science such students will obtain from discussions that gloss over difficulties and apparently require no rigorous thinking on the part of the reader. The scarcity of numerical examples and diagrams, the lack of end-of-chapter questions, the near-absence of subheads in the text, the masking of important definitions by philosophical asides—these hardly seem calculated to help beginners in learning science.

One other aspect of the book makes it ill-suited for elementary classes. At times the author is lured by his philosophical rambling into assertions which by themselves sound pretty extreme. One example, at the end of a discussion on entropy, probability, and determinism, is this bald statement: "We have recovered free will." Another, apropos "the white-coated multitude" of applied scientists, is the statement: "These men are the most dangerous of all. They are the illusion but not the stuff of which civilization is made." Now both of these examples are here taken out of context, and both are reasonable enough in the paragraphs where they occur. But elementary students have a genius for taking statements out of context; these examples are the sort of thing that students like to underline in red pencil, and remember long after they have forgotten the rest of the text.

Objections of this sort are, of course, only facets of the much-debated and never-solved question of how science can best be presented to liberal arts students. In defense of a book like this one, it can be argued that a student on reading it will find science palatable, he will get at least an emotional appreciation of the contributions of science to our culture, he will learn enough of the vocabulary to sound sophisticated, and he should be impressed with the provisional, empirical nature of scientific hypotheses. Perhaps this is all that can be expected. For teachers who feel that students need more personal contact with the rigors of scientific thinking, however, the book can serve only as a supplement to a more orthodox presentation.

As supplementary reading in an elementary course, or as a text for more advanced students with a sound background in science, philosophy, and history, the book is a valuable contribution to the increasing body of literature that attempts to bridge the gap between the "Two Cultures" of C. P. Snow, the scientific and humanistic cultures of the modern world.

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Miscellaneous Publications

(Inquiries concerning these publications should be addressed not to Science, *but to the publisher or agency sponsoring the publication.)*

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