remain, unique in the history of science.

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Sir Mark Oliphant first met Ernest O. Lawrence at the Cavendish Laboratory in 1933, shortly after the Seventh Solvay Conference held in Brussels in October of that year. Oliphant's two-part article, "The Two Ernests," appeared in the September and October 1966 issues of PHYSICS TODAY. *He is presently a professor of physics in the Research School of Physical Sciences at the Australian National University in Canberra, Australia.*

In defense of people

WHO SPEAKS FOR CIVIL DEFENSE? Eugene P. Wigner, ed. 127 pp. Charles Scribner's Sons, New York, 1968. Cloth $3.95, paper $1.65

by L. MARTON

Walter Conkite, in his introduction to this collection of essays on civil defense, deplores apathy of both government and the public for the problems of civil defense, and hopes that the present book will set off a chain reaction of discussion, examination and finally action on civil defense. He ends his introduction with the question: "Whatever happened to civil defense?"

The answers are partially given by "those who speak for civil defense". The studies were "sponsored by the Civil Defense Forum, a non-profit corporation organized to educate the public about the problems of civil defense" and written by physicist Eugene P. Wigner, Neal FitzSimons, of the Office of Civil Defense, Steuart L. Pittman, former Assistant Secretary of Defense, Walter H. Murphey, who surveyed civil defense in 1967, Bjorn Klinge, a Swedish authority on civil defense, and Herbert Roback, of the Military Operations Subcommittee, House of Representatives. The subjects covered are "Nuclear War and Civil Defense", "Brief History of American Civil Defense", "Government and Civil Defense", "Civil Defense Abroad", "Civil Defense and National Defense" and a brief Afterword, followed by an Appendix containing a letter to the President.

Wigner's chapter is highly technical and gives a very good description of the short-term effects of nuclear war. He analyzes the different effects of nuclear explosions together with consequences on civil defense. It is a very matter-of-fact presentation of the whole subject and contains a remarkable amount of data that are highly authoritative and presumably not subject to much controversy. The next two chapters, by FitzSimons and Pittman, describe in much detail the hesitations, false starts and changes in policy on civil defense that have occurred in the last few years. These chapters are interesting reading but not very encouraging. They reflect a kind of lack of action that characterizes several other important projects and that hampered, unfortunately, many other worthwhile ones. A short quotation from one of these papers is quite significant: "We rest today on a plateau of indecision held up by operational progress, which may keep open the door for the decision makers until they are ready. And it may not, resulting in the loss of invaluable years of lead time on whatever damage-limiting system is finally decided upon." In strong contrast Murphey's and Klinge's contribution describes some of the very active civil-defense projects that have been instituted abroad.

Roback's chapter analyzes the problems arising from competition between civil defense and national defense. A prevailing view in some circles is that a strong national defense may make civil defense unnecessary. As expected, the final result of the analysis is that considerably more money is needed for epansion of civil defense, but the present conditions of money shortages make the outlook rather grim. In his Afterword, Pittman shows that the latest budget figure for civil defense was about two thirds of the request for the previous year, which in turn was the lowest figure since the Defense Department took over civil defense in 1961. He ends his remarks with a very strong criticism: "The critical long-term task of improving our chances of survival in the nuclear age may be too important to be decided exclusively in the closed chambers of a government so pinned down by today that the problems of tomorrow must be set aside and assigned 'the lowest possible sustaining rate'."

In this strong plea for an improved civil-defense attitude and improved means for it, the problem of immediate survival is very clearly exposed. A very important aspect of civil defense, in my mind at least, is the aftermath of a nuclear attack. By aftermath I mean all the effects of destruction of communications, of production, of transportation, of power distribution, and so on. Not the least of these effects will will be the possible results of epidemics engendered and propagated by the confinement of the population during a certain period under unsanitary conditions. Of course the treatment of all these effects would take a much larger book than the one presented here, but I think that any serious consideration of civil defense should include a thorough examination of the long-range effects produced by any such attack. Al-

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though the present book constitutes a good introduction to the short-range problems, it gives me the impression the long-range problems, for the time being at least, are almost a monopoly of the science-fiction writers.

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Nature of the physical world

THE CHANGELESS ORDER: THE PHYSICS OF SPACE, TIME AND MOTION. Arnold Koslow, ed. 328 pp. George Braziller, New York, 1967. $7.50

by EUGENIE V. MIELCZAREK

The changeless order, the nature of the physical world, has fascinated Man since his emergence from a lower form. Central to the development from fascination into physical science has been Man's attempt to define and relate the concepts of space, time and motion. In this book Arnold Koslow, a member of the philosophy faculty at Brooklyn College, traces the development of ideas central to mechanics, electromagnetism, quantum theory and the more general problem of the development of conservation laws. The contents are organized into two parts: Space, Time and Motion, and Conservation. The reader progresses from the Greek investigations, through the observations of Galileo and Issac Newton, to Mach's innovations, to our present understanding and its limitations as represented by Albert Einstein, Eugene Wigner and others.

Part I commences with selections from Plato on space and Aristotle's discussion of motion and time. Excerpts from Galileo and Newton and Koslow's introductions focus the reader's attention on the concept of inertia. Gottfried Wilhelm Leibniz, Immanuel Kant and Leonhard Euler are also included. Ernst Mach's rebuttal of Newton's discussion of absolute rotation is followed by excerpts from Einstein and Sciama. The coherence of this first part is excellent and the reader's understanding is heightened by prefaces by Koslow, who ably demonstrates his knowledge and enjoyment of physics. Part II, Conservation, includes James Joule, on the mechanical equivalent of heat; Michael Faraday, on conservation of charge, and Einstein, on conservation of mass. The concept of inertia reappears in a discussion by Von Laue on the inertia of energy. The climax of the book comes with two articles by Gerald Feinberg and Maurice Goldhaber, and Wigner on current attempts to formulate symmetry laws.

The book is good. Certainly, educated men will find it profitable and fascinating reading. It might also provide a basis for an undergraduate course on the history and philosophy of physics. However, the nonphysicist will probably be disappointed if he is unable to fully comprehend the last group of articles on current attempts to formulate symmetry laws. A phrase such as "four vector momenta" and a nonfootnoted figure in Wigner's article are not meaningful to the uninitiated.

The obvious solution is that we should do a more thorough job of explaining physics to nonphysicists; however, this is a task incumbent upon us and not upon those like Koslow who record and appreciate.

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The reviewer is an associate professor of physics at the George Mason College of the University of Virginia.

Planetary physics and our long-neglected satellite

AN INTRODUCTION TO THE STUDY OF THE MOON. By Zdeněk Kopal. 450 pp. Gordon and Breach, New York, 1966. $27.50

by S. FRED SINGER

The study of the moon has become a major national goal supported by multi-billion-dollar budgets; a great many people, including some scientists, are now beginning to pay attention to our long-neglected satellite. This volume represents an excellent approach to the study of the moon. Although the title is misleading; the book is much more than an introduction. Furthermore much of the material is oriented towards planetary bodies generally, with the moon merely as an example. By emphasizing basic methods and not just phenomena and facts, the author

NASA

GOCLENIUS CRATER. An unusual feature of this crater is the prominent rille that crosses its rim. This 40-mile-diameter crater is located at 10°S latitude and 45°E longitude. The three clustered craters, upper left, are Magelhaens, Magelhaenes A and Colombo A. This photograph was taken during the Apollo 8 flight.