Mr. Wright's book begins with the cloud chamber, but doesn't even mention Victoria or the Rolls Royce.

Don M. Yost

California Institute of Technology
Pasadena, California

About the Reviewer: We have again received, with gratitude, a review from our almost regular and always welcome contributor to this department of Nuclear Science and Engineering. *In pointing out that the preparation of a review is not strictly a one-man deal these days, Professor Yost acknowledges the assistance of Mrs. Yost, of their secretary, Mrs. Ruth Hanson, and of philosophical discussions with Mr. and Mrs. T. C. Vint of Tuscon and with Señora Lupe de Sinaloa of Palo Alto. As many of our readers know, Dr. Yost retired not long ago as Professor of Chemistry at California Institute of Technology.*

Two-Group Reactor Theory. By J. L. Meem, Gordon and Breach, New York, N. Y. (1964), 417 pages including 80 pages of Appendixes, $20.50.

This book was designed for use as a text at the advanced undergraduate or beginning graduate level with emphasis on the "engineering analysis of reactors rather than fundamental reactor physics." In part I, one-group diffusion theory is introduced, together with Fermi-age theory and elementary reactor kinetics. In part II, two-group theory is developed and applied to treat control-rod worth, heterogeneous reactors, and fast reactors. Detailed applications are made in the appendixes to a pool reactor, a natural-uranium graphite reactor, and a fast critical assembly.

The author states that the principal objective of his book is to assist the student in attaining proficiency in carrying out two-group calculations on a variety of reactors—including bare and reflected, water-moderated, heterogeneous, and fast systems. Personally, I would question whether such proficiency is important for the nuclear engineer. It would seem to me rather more important for the beginning student to acquire a physical understanding of the nuclear characteristics of various systems, together with an impression of the sorts of calculations that would be required for a realistic and detailed analysis. I would hope that it would suffice for him to go through a two-group two-region calculation one or fewer times in his life. However, even granting the author's premise that it is important for a student to become proficient in two-group calculations, the book invites a number of criticisms.

Some blame must surely be placed on the publisher for charging over $20 for a textbook numbering only about 300 pages, not including "appendixes." For such a price one might at least expect an outstanding publishing product, but I must report that there is not even a clear and consistent typographical distinction made between scalar and vector quantities.

In addition, the text is characterized by a casual syncretism that must surely baffle or mislead the student on many occasions. For example, on page 21, the student is told that the thermal-neutron scattering cross section of a hydrogen nucleus (bound in H_2O) is 95 b and that data to the contrary in BNL 325 should be ignored. It turns out that this incorrect value is recommended so that the student can use $\sigma_{tr} = (1 - \bar{\mu})\sigma_s$ together with the unbound value of $\bar{\mu}(2/3)$ and still obtain a reasonable value of σ_{tr}. Surely it would have been better to give simply a reasonable value of σ_{tr} without incorrect σ_s and $\bar{\mu}$. As another example, on page 36 shortly after a conventional definition of the (scalar) diffusion coefficient, we find the unelaborated statement "... the diffusion coefficient, D_z, in the z direction is not necessarily equal to that in the x and y direction." How can the student understand this? And so on.

In summary then, the reviewer regrets to report that he can find little to recommend in the present book.

George I. Bell

University of California
Los Alamos Scientific Laboratory
Los Alamos, New Mexico

Received November 29, 1965

About the Reviewer: George I. Bell received his PhD degree in Theoretical Physics from Cornell in 1951. Since then, he has been a member of the staff of the Los Alamos Scientific Laboratory. He has also served as a visiting lecturer on Applied Physics at Harvard University (1962-63) and a Professor of Physics (part-time) at the University of New Mexico. In the field of reactor physics, he has contributed to the theories of cavity reactors, resonance absorption, stochastic multiplication, and neutron transport.

Fission Product Yields and Their Mass Distribution. By Yu. A. Zysin, A. A. Lbov, and L. I. Sel'chenkov. Authorized translation from the Russian. Consultants Bureau, New York (1964), 121 pages, $15.

This book, which covers the literature through 1962, is the most comprehensive compilation of fission product yields that has come to the reviewers' attention. Spontaneous fission, as well as fission by neutron, proton, deuteron, alpha particle, and ^{12}C irradiations in the energy range from around threshold to 100 MeV is covered; in the case of fission by gamma-ray irradiation, the energy range extends to 300 MeV. The fissioning nuclides include all those studied from Bi to ^{252}Cf. Independent fragment yields, are given in cases where they have been measured.

The book consists of 26 pages of introductory material covering various aspects of the fission process, 36 tables of yields, 166 schemes of decay chains, 155 references associated with material presented, and 88 supplementary references that are pertinent to the general subject matter. The introductory sections discuss the effects of excitation energy and the nuclear charge Z of the fissioning nucleus (i.e., the compound nucleus) on the distribution of fission products and average number of neutrons emitted. Symmetric fission is favored by low Z and by high excitation energy. Asymmetric fission is favored by high Z and by low excitation energy E_{ex} and is particularly pronounced in spontaneous fission. For example, ^{226}Ra irradiations produce three peaks of about equal height (two for asymmetric and one for symmetric fission) with 11-MeV protons (E_{ex} = 16 MeV), a large symmetric and two smaller asymmetric peaks with 21.5-MeV deuterons (E_{ex} = 29.3 MeV), two large asymmetric and a smaller symmetric peak with 31-MeV alphas (E_{ex} = 26 MeV), and a large very broad hump (covering the entire fission-fragment-mass range) with 43-MeV alphas (E_{ex} = 38 MeV). Closed-shell or "magic-number" effects on the fine structure are described in some detail.

This volume may be compared with E. K. Hyde's *The Nuclear Properties of the Heavy Elements. III. Fission Phenomena* (Prentice Hall, 1964). Hyde gives much more descriptive detail concerning the various aspects and theories of the fission process, but fewer tabulated yield data. Hyde's volume is a textbook, whereas this volume is more like a handbook. In this sense they are mutually supplementary.

There are a number of errors in the book, although many of those we noticed could be corrected by the reader without resort to the references. For example, on page 8 "$\bar{A}_T$" is used in Eqs. (3) and "$\bar{A}_L$" is used in the text for the average mass of the lighter mass peak. In Fig. 2 the right-hand ordinate should indicate "^{238}U," not "^{235}U." In the second sentence of the last paragraph on page 8, "^{233}U" should read "^{235}U." In the previous sentence, a reference should have been given for the fission yield of "approximately 0.05%" for ^{9}Li. In the caption of Fig. 10 on page 17, the points marked as (1) should be "measured values" rather than "reflected values." Evidently one or more words have been deleted from the end of the last sentence on page 21. Table 18 has "^{238}U" in the caption and "^{233}U" in the column heading referring to the same nuclide. In Table 38 numerical values of the half-lives are given, but not the units; the reader must verify for himself that all the numbers are in hours.

It would have been helpful to the reader with a specific interest in mind if abbreviated captions and starting page numbers of each table had been given in the Table of Contents. A number of references are made to the 1958 Geneva Conference without giving volume and page numbers, making them more difficult to find. We feel that more references should have been given to original work rather than to compilations in cases where only the latter were given.

In summary, the book is essentially a handbook on fission yields and should be a valuable asset to anyone in the field.

R. W. Stoughton
Robert L. Ferguson

Chemistry Division
Oak Ridge National Laboratory
Oak Ridge, Tennessee

About the Reviewers: R. W. Stoughton has been a group leader in the Chemistry Division of the Oak Ridge National Laboratory since 1943. Prior to that he conducted radiochemical research on the Plutonium Project with G. T. Seaborg at the University of California and at the Metallurgical Laboratory in Chicago, after receiving his PhD at the former institution. His interests have involved reaction kinetics, radiochemistry, process development, neutron cross-section measurements, and thermodynamics of solutions.

Robert L. Ferguson obtained the PhD degree at Washington University before joining the Research Staff of the Oak Ridge National Laboratory in 1959. His interests have included the division of nuclear charge in fission and other fission phenomena, nuclear methods of chemical analysis, and nuclear spectroscopy.

A New System of Chemical Philosophy. By John Dalton. New Edition, Philosophical Library, New York, (1964). Introduction by Alexander Joseph, Director, National Science Foundation In-Service Institute in Physics, Bronx Community College-City College, City University of New York. 168 pages, $6.00.

About a century and a half ago, the development of the theory of matter paralleled, in many respects, the current development of the theory of the nucleus and the fundamental particle. Experimentalists were learning to investigate the physical and chemical changes that could be induced in matter with increasing precision, and as this knowledge grew, the need for generalizations became acute. Beginning from about 1800, scientists and philosophers proposed and developed the modern atomic theory, and by 1860 the atomic theory had been accepted essentially as we know it today. One of the most astute of these scientists was John Dalton, an English school master who is credited with the first important contribution to the atomic theory. In 1808 he published much of his work in his *New System of Chemical Philosophy*. After about 150 years, a new edition has now appeared.

The first two-thirds of the book deal with heat or caloric theory. Although the section headings of this portion of the text read much like those of a modern text of physical chemistry, science has long since rejected the caloric theory that Dalton accepts and uses here. However, the reader will find it very easy to become interested in Dalton's many ingeneous contrivances and explanations for the phenomena as he knew them. It is equally interesting to read how he condescendingly dismisses Count Rumford's crucial cannon-boring experiments concerning the production of heat—experiments which are often considered as beginning the downfall of the caloric theory.

Dalton's theories of the structure of matter, described in the last section of the book, are also largely obsolete, but in the last few pages he describes the contribution for which he is noted. The idea that matter was composed of atoms was not new to him, but the idea that atoms of constant weight unite to form compounds of definite proportions is credited to Dalton. Furthermore, he proposed a remarkable system for determining the formulas of compounds, which, although since proved erroneous, led him to establish a table of atomic weights. Even more remarkable was that he based his system on nothing more than the principle of maximum simplicity. In other words, he believed that, if nature had a choice between the complicated and the simple, it would always take the simple. Because Dalton could not foresee the correct nature of gases, his atomic weights turned out to be incorrect. However, his ideas persisted and stimulated the work that eventually led to correct atomic weights.

Aside from the obvious interest of this edition to the historian of science, it will also be of interest to anyone who has ever wondered how the atomic theory developed. Except for the short introduction by Alexander Joseph, there is nothing except Dalton's original text. I would have preferred to see explanation of some of the archaic terminology, and perhaps references to some of the other workers to whom Dalton refers. But these minor criticisms should not deter anyone from reading Dalton, since his ideas are clear.

R. E. Meyer

Chemistry Division
Oak Ridge National Laboratory
Oak Ridge, Tennessee

About the Reviewer: R. E. Meyer, a chemist at the Oak Ridge National Laboratory since 1956, is presently engaged in corrosion and oxidation studies with particular interest in film growth on metals, reduction processes on passive metals, and dissolution reactions. Between completion of his studies at the University of Chicago in 1954 and the beginning of his present association, he taught chemistry at the University of Illinois.