nuclear bomb. These contributions are described in some detail. In this part of the book attention is understandably focused on the research aspects of the release of nuclear energy, to which Fermi contributed much. However, the broader features of this development, including the financial, managerial, and engineering contributions to the Manhattan Project are somewhat deemphasized. The reader not familiar with these aspects may gain a somewhat distorted view of the remarkable achievements made by the Manhattan Project in such a short period of time.

It should be kept in mind that for the success of this project

1. Vast sums of money were required at a time when mobilization was taking place for the invasion of Europe, and when the war with Japan made great demands upon our resources.
2. Engineering process design, construction, and management on an unprecedented scale and tight time schedules were required.

In the first category, Lindemann, through Churchill, played an important part in keeping Roosevelt reassured of the high priority that should be attached to the Manhattan Project. During an information exchange visit that I made to England during the winter of 1944, Lindemann told me of some aspects of this problem.

In the second category, the chemical and petroleum process industry had reached a high degree of proficiency in the United States during the period before World War II. Many individuals in this industry possessed a high degree of competence and qualities of leadership that enabled them to approach these novel problems with skill and effectiveness. Without the able contributions of men from such companies as DuPont, Union Carbide, Kellex, and others, the ideas of nuclear fission would have remained for many additional years in the laboratory stage.

These comments are not made as a criticism of this book by Professor Segrè, which understandably has as its primary scope the impact of the works of Fermi upon physics and scientific thought. The book is carefully prepared and can be recommended highly.

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December 13, 1971

About the Reviewer: Gene Booth is now director of research at Stevens Institute of Technology and dean of the Graduate School following a period in industry (American Optical Company) and civilian service for the military (scientific director for the Supreme Allied Commander). In the interval 1937-1959 Professor Booth was associated with Columbia University where, during the war years, he made outstanding contributions to the science and technology of the Manhattan Project, especially the gaseous diffusion process for separation of the uranium isotopes. Professor Booth's undergraduate and early graduate studies were at the University of Georgia. He completed his formal studies in physics at Oxford.

Principles of Activation Analysis. By Paul Kruger. Wiley-Interscience Publishers (1971). 522 pp. $25.

This is a difficult book to review. It has many good features and it has many poor features. It is stated to have been designed as a textbook for college students, but it reads rather more like a reference book. Almost everything that should be said about activation analysis is there (along with an excessive amount of extraneous material), but it is unfortunately all said in a monotone. Subjects of very slight importance, such as second-order minor complications, receive the same amount of treatment as subjects of paramount importance. A student with no previous experience in the field of activation analysis would very likely be quite confused if this book were his only source of information on the subject. He would probably never be able to see the forest for the prodigious number of trees. There are too many side excursions into irrelevant areas, making the book excessively long and expensive. The style is rather pedantic and uninspiring. It reads too much like a conglomeration of extracts from the literature put together in some logical order by a trained scientist—but unfortunately one with only little actual personal experience in the field of activation analysis. The book contains an unusually large number of errors—typographical and otherwise.

On the brighter side, this book contains a great deal of factual information on the subject of activation analysis, with a large number of excerpts (photographs, figures, graphs, and tables) from the literature. It thus appears to be a good reference book for the library, but not a very useful textbook. In nine chapters, occupying 511 pages of text, the author treats the subjects of

1. stable and radioactive nuclides
2. radioactivation
3. irradiation sources
4. radionuclides
5. radiation detectors
6. radiochemistry and radioactivity measurement
7. activation analysis practices
8. activation analysis limitations
9. activation analysis applications.

At the end of each chapter, a number of problems are given (averaging about 1.5 pages per chapter), and a collection of bibliographical references is given (averaging about 2 pages per chapter). The book is well indexed.

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About the Reviewer: Vincent Guinn is professor of chemistry on the Irvine campus of the University of California. Professor Guinn received his early academic training at Southern California and completed his graduate studies at Harvard. He has had wide experience in industry, most recently with Gulf General Atomic. His principal interests are in radiochemistry, radioactive tracers, and activation analysis.

The Foundations of Neutron Transport Theory. By Richard K. Osborn and Sidney Yip, Gordon and Breach Science Publishers, Inc., New York (1966). 126 pp. $8.75

This monograph was a pleasure to review. From their collection of "bits and pieces" the authors have assembled

a logically concise and clear presentation of the foundations of neutron transport theory.

After a brief introduction (Chap. I), the transport equation in coarse-grained phase space is developed in Chap. II including the time evolution for the neutron singlet density, collision terms, and external field effects.

Chapters III and IV are devoted to the neutron nuclear interaction, nuclear and medium effects, respectively. After a careful exposition of the notation the authors discuss radiative capture, elastic scattering, fission and inelastic scattering, and the neutron balance equation in momentum space. In Chap. IV medium effects present in the ideal gas model and crystals are discussed including radiative capture, elastic scattering, and (for crystals) the thermal average.

In Chap. V neutron thermodynamics and the doublet density are examined and a concise discussion of the H theorem and the diffusion approximation is presented.

Overall, this reviewer found this monograph a very refreshing reading and worthwhile piece of work. The authors justifiably neglect a number of effects, such as spin-dependent scattering, n-n interactions, etc., as not being relevant to reactors, but are always careful to note the approximations made. The criticism that "they couldn't have gotten these results without knowing the answer" is wholly unjustified. The List of Symbols is a welcomed addition.

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January 10, 1972

About the Reviewer: The reviewer is a theoretical physicist at Los Alamos Scientific Laboratory where he has made significant contributions to neutron behavior. Dr. Lee has contributed to these columns previously.

The Measurement of Time-Varying Phenomena. By E. B. Magrab and D. S. Blomquist, Wiley-Interscience, New York (1971) 338 pp., $16.95.

This book covers both analytical and experimental techniques for the interpretation of time-varying phenomena in the form of electrical signals. As such, it is useful to the practitioners of many fields of science and technology, including nuclear reactor dynamics.

The book begins with consideration of the fundamental concepts of harmonic analysis and noise analysis. (The Fast Fourier Transform is just fleetingly mentioned in the final chapter.) This is followed by a treatment of filters, largely in general terms. The only specific types treated at this point are simple R-C single-section types. The properties of Butterworth, Chebyshev, and linear-phase filters are discussed but no design information is given. Some active filters are briefly considered in the next chapter.

An extensive treatment of amplifiers includes discussion of noise, linearity and dynamic range, input impedance matching, and negative feedback. The operational amplifier is introduced and a number of linear and nonlinear operational-amplifier circuits are covered. The discussion of comparators and Schmitt triggers does not distinguish between the two, although the hysteresis of the latter is mentioned in a later chapter. Analog multiplication is discussed in terms of the quarter-square multiplier, but there is no mention of the many commercial multiplier modules available, including the inexpensive monolithic units that are suitable for relatively undemanding applications. Chopper-stabilized dc amplifiers and regulated power supplies are briefly discussed, but current amplifiers of the type used with ionization chambers are not mentioned.

The next chapter considers various types of voltage detectors, including peak, average, RMS, and phase-lock types. Squaring-circuit and thermocouple RMS detectors are discussed, but the possibility of using multiplier modules for this purpose is not mentioned. Neither is there mention of the idealized-diode operational-amplifier circuit as a corrective for diode imperfections in linear detectors.

Following this is a discussion of various types of data recorders, including mechanical oscillographs, cathode-ray oscilloscopes and their associated circuitry, and magnetic-tape recording, both analog and digital. The next chapter covers generators of sinusoidal, pulse, and random-noise waveforms for system excitation. There is no mention of the pseudorandom-square-wave method. The voltage-to-frequency converter is discussed but only in terms of the voltage-controlled oscillator. There is no mention of the important type in which an analog integrator charges up to a discriminator level and is set back by a standardized pulse. Furthermore, the explanation in the next chapter of the voltage-to-frequency-converter type of digital voltmeter is incorrect.

The final chapter covers digital techniques and includes discussions of the principles of sampling, binary coding, quantization, and digital logic. It also describes the workings of various digital devices including analog-digital converters, counters, digital voltmeters, and small computers.

The book ends with a glossary and with appendices covering decibel notation, ground loops, and the matching of signal sources to amplifier inputs.

This book will be quite useful as a starting point for the person wishing to learn how to apply these techniques to his own field. It gathers together a wide variety of material normally covered in many different places. A great variety of practical examples enhance the presentation. However, proper understanding requires at least a rudimentary knowledge of electronics.

On the other hand, this is a small book covering a large area, so the reader will have to consult additional sources for more detail, either to aid in understanding unfamiliar concepts or to assist in implementing a practical application. The bibliography is somewhat limited and many of the entries are manufacturers' bulletins.

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About the Reviewer: Charles Cohn is currently an associate physicist in the Applied Physics Division of Argonne National Laboratory, with which he has been affiliated since 1956. He has done work on noise analysis in nuclear reactors and on the application of computers to nuclear-reactor experiments. He holds AB, MS, and PhD degrees in physics from the University of Chicago, and is a member of Phi Beta Kappa and Sigma Xi.