Nuclear Reactor Control Engineering. By Joseph M. Harrer, De Van Nostrand Co., Inc. Princeton, N. J. (1963). 587 pp. $16.00.

It's about time someone wrote a new book on reactor and plant control, and Harrer's book represents a substantial advance. This new book is a review-type state-of-the-art text, and as such, regrettably will not keep up with all the changes as new reactors are brought on the line. Nevertheless, control principles and problems are thoroughly reviewed. From an engineering point of view, a solid history of control design is presented. Herein lies the author's principal tutorial points: engineers today, in their design of new reactor control systems, simply do not examine the prior literature or the work accomplished on existing reactors before they go off and invent a new control system of their own; and very often, the new system contains features that have already been discarded in the light of operating experience. Joe Harrer has the advantage of being familiar with both design and operation of reactor systems and, consequently, his philosophies are always on the practical side.

Nuclear Reactor Control Engineering is a homey sort of book that completely reflects the author's personality. In discussing how to locate neutron detectors around the reactor, the engineer is given the intriguing advice to observe intelligently an existing nearby similar system and gather data about its performance. This, then, is the keynote of the text—experience.

The preliminary chapters of the book give an outline of reactor classification, elementary reactor core physics and reactor kinetics. An excellent chapter on neutron detecting instruments follows, giving examples of many commercially available instruments and circuits. The best chapter in the book is on control-rod drive mechanisms and contains dozens of photographs and drawings of existing mechanisms, special motors and components. The chapters on feedback control systems and reactor transfer functions are somewhat weaker, but the book is not intended as a school text and some prior knowledge of the elements of servomechanisms is presumed. Many of the illustrative examples used in the feedback and stability areas stem from the work at Argonne National Laboratories on EBWR and boiling-reactor control problems are consequently emphasized.

The chapter on reactor safety presents an excellent discussion on safety system logic, including the development of algebraic figures of merit for various logic configurations. The author's private philosophy is summed up in the preface to the book as "One good reliable protective device is better than several unreliable 'gadgets' working as backups for one another."

This is an extremely important point since the historical pattern in reactor safety instrumentation was the first to rely on a large number of scramming devices for protection. When this type of design was effectively shown to be unworkable, many simplified designs appeared, particularly in the submarine program where possibly only a dozen scramming devices were employed. Now the trend appears to be toward adding more scramming devices again in the all but futile effort to be 100% fail-safe. It is hoped that Harrer's practical and worthwhile philosophies will be heeded.

The final chapter on computers and simulator applications is vaguely reminiscent of the Schultz text with some updating. A start is made, however, in the presentation of the use of digital techniques in this time-honored analog field.

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About the Reviewer: M. A. Schultz is the author of the first definitive text on the "Control of Nuclear Reactors and Power Plants." He has been in the nuclear control field since its inception and at present serves as a nuclear consultant on reactor safety instrumentation and control problems, as well as being a vice president of Milletron, Incorporated. Mr. Schultz has had many arguments with his old friend Joe Harrer, and has no hesitation in critizing him wherever he feels the need warrants.

Technique of Inorganic Chemistry Volume III. Edited by H. B. Jonassen and Arnold Weissberger. Interscience Publishers. 345 pp. $11.50.

This small, but useful book represents the third volume of what should become a most useful series for the inorganic chemist. The first chapter deals with inorganic gas chromatography and purports to present a survey of the field, together with comments specifically applicable to inorganic chromatography. Neither objective is fulfilled adequately even though an impressive number of references is amassed. The theory of gas chromatography is briefly reviewed at the outset, but it appears doubtful that a sufficiently accurate picture of the theoretical aspects has been presented to avoid the need for extensive review of the cited literature by the reader. The section on the applications of gas chromatography is close to being properly oriented, but the predominant

influence of organic chemistry in this field resulted in heavy reliance on results that may not be entirely useful to the inorganic chemist. The chapter appears to have been hurriedly written, the illustrations poorly chosen and the references not sufficiently recent, making it rather inferior to several older discussions of the same topic. The major deficiency of this chapter, however, is the preoccupation with organic chemistry rather than an orientation toward inorganic gas chromatography.

The second chapter deals with electron microscopy and represents a well written, logically constructed adventure into this complex field. The subject is introduced by a fast-moving section on the theory of electron microscopy which is illustrated by well-conceived drawings and diagrams. A discussion of photographic effects reflects the interest of the author, and is of particular value to those not familiar with the foibles of the readout process from electron microscopy. Features of the instruments and applications to specific requirements are followed by a discussion of the applications of electron microscopy to a variety of tasks. The excellent section of applications appears to cover the field completely, with particular emphasis to inorganic systems. The section on applications is profusely illustrated with exceptionally fine examples of results obtained by a variety of workers. The chapter closes with an extensive bibliography which should provide the necessary starting point for anyone interested in the application of electron microscopy to inorganic problems.

The two final chapters cover experimental techniques applicable to radioactive materials. The third chapter deals with techniques applicable to work with high levels of beta- and gamma-emitting materials. The subject is clearly a very complicated one, but the author has succeeded in preparing an excellent survey. Since relatively little theory underlies the specific techniques operable under the difficult conditions encountered, most of the chapter deals with examples of reported techniques and equipment designs. An introduction covering units, standards, legal regulations and health-physics aspects is valuable in that sufficient references to the published literature are cited to permit the reader to pursue facets of this discussion. The section describing shielded facilities and their unique aspects gives the reader an excellent guide for further search. It is perhaps regrettable that the section on radiation effects, decontamination and waste disposal is brief since these problems constitute a most annoying and unrewarding part of working with radioactive materials. In general, however, the field has been surveyed adequately, and the reader will find references to any of the problems likely to be of importance.

The final chapter deals with glove-box techniques and is highly recommended to everyone who has occasion to use these devices. The author has made a significant contribution by assembling under one reference a wealth of experience in specialized techniques used in glove boxes. The chapter includes a section on glove-box construction of interest to the novice and also to the veteran experimenter. The section on specific experimentation probably represents the most useful portion of the chapter and can serve as a reference even to those with considerable experience in glove-box manipulations.

The book is generally well assembled, appears to be free of typographical errors, and should serve adequately as a companion to its well known organic-chemistry counterpart.

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Perturbation Theory and the Nuclear Many Body Problem. By K. Kumar. North-Holland Publishing Co. - Amsterdam; Interscience Publishers, Inc. - New York. 235 pp. $9.75.

The study of the properties of systems of interacting particles makes up a large part of physics and an even larger part of its applications. At sufficiently low temperatures, quantum effects become important and finally dominate those problems which require finding the detailed energy spectrum or other properties of the stationary states of a system. The theory of such quantum mechanical systems has advanced tremendously and on a very broad front in the past ten years, largely through application of the techniques of quantum field theory which had been developed in the forties and early fifties.

One of the outstanding many-body problems has