The basic techniques are then illustrated with examples, including simultaneous differential equations (kinetic equations), Xenon buildup and radioactive decay. For those who have access to an analog computer an extensive list of computer diagrams for transfer-function simulation are included in the appendix.

Chapter 7 deals with system design. As a control system must correctly respond to both command inputs and to system disturbance the designer must insert compensation networks into the design. This chapter attempts to give the reader a feeling for the problem the designer has in compensating his system so that it will meet the response specifications. First, various specifications are defined, classifying them into time domain and frequency domain. Then, error constants are discussed as a tool in the relating of frequency and transient response. With this background the remainder of the chapter presents, with examples, the two basic techniques for compensation of control systems: series compensation and minor-loop compensation. Finally a time-domain synthesis technique which lends itself to machine calculation is presented. The chapter is well organized and does what it attempts,—i.e., it gives the reader an appreciation of the designer's problem of system compensation.

Chapter 8 relates the previous chapters to the statistical control theory. Starting with definition of mathematical tools, gaussian distribution, correlating functions and special density, it gives the input-output relation for correlation functions and spectral densities, and an application of random-noise theory to measurement of system characteristics. The same chapter goes through elementary calculus of variations, formulation of the mean square error for linear systems, and free-configuration minimization of the mean square error. Finally there is a discussion about minimization of the effect of reactor noise.

Although this book is published as a monograph it covers a number of different fields of engineering discipline and it can be called a condensed handbook rather than a monograph. The author was very successful in condensing a tremendous volume of material in a relatively small book of 285 pages. He left out only one aspect: warning the reader in the preface that in all chapters some previous background in the related subject is assumed. The only disadvantage of his treatment is to force the user to look up a number of references in fields which are out of his own specialty and could not be thoroughly explained in such condensed form. The book is a very valuable help for the nuclear engineer and the low price puts it within his reach.

The industry desperately needs these types of condensed handbooks with an extensive list of references.

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The Technology of the Treatment of Uranium Concentrates. By N. P. Galkin, A. A. Maiorov and U. D. Veryatin. The McMillan Co., New York, (1963). $7.50. 204 pages.

This monograph, translated from the Russian, gives an account of the chemistry and technology of uranium extraction from the ore-concentration stage to metal production. In addition to several chapters devoted to uranium refining, a portion of the book is devoted to the production of the intermediate compounds (uranium oxides and uranium tetrafluoride) from which the metal is produced.

In a treatise of this kind one might expect to find major emphasis on Russian work in this field. Such is not the case for this book. The reader will find no references to Russian technology and only a few references to Russian chemical literature. For the most part, the book is a review of the published literature of the U. S., Canada, and Europe. The first chapter traces the history of the development of the uranium industry, but only for the Western countries. Estimated uranium production figures are given for the 'capitalist' countries, but none are given for the communist countries.

Despite the title, the book emphasizes strongly the chemistry, rather than the technology, of uranium separation and conversion into intermediate compounds,—in fact, the book is notably weak in technology. The principal value of the monograph lies in its excellent account of the large variety of chemical methods for separating uranium from impurities with which it is associated in nature. A large number of flowsheets for

uranium refining are presented in block diagrams. The authors stress the older, more conventional aqueous extraction and precipitation methods for uranium purification. The modern techniques involving ion exchange and solvent extraction are discussed only briefly and in a manner which lacks authoritativeness. The production of uranium tetrafluoride by precipitation from aqueous solution is described in some detail.

One short chapter devoted to the production of the oxides of uranium contains little useful information. The authors have missed completely the common method for large-scale production of uranium trioxide by thermal decomposition of uranyl nitrate. In another chapter which discusses the gas/solid reaction schemes employed for many years in the U. S. and elsewhere for the production of uranium dioxide and uranium tetrafluoride, the authors appear to have only sketchy knowledge. These schemes are referred to in the book as new methods which " . . . have been appearing in the literature recently." The authors are similarly unaware of the importance of the newest method for producing refined uranium hexafluoride by fractional distillation of crude uranium hexafluoride made from ore concentrates. The book displays little understanding or appreciation for the most modern technological methods, such as the use of the fluidized bed for the production of uranium compounds. The authors confuse fluidized beds with moving beds in some descriptions.

Although the book is weak in the areas mentioned above, it contains a good review of the aqueous separation chemistry of uranium. It can serve as a useful reference for research and process workers concerned with the extraction of uranium from its ores, and for analytical chemists and others interested in the separation of uranium from various materials.

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Heavy Water Lattices. Report of a Panel held in Vienna, 18-22 February 1963. International Atomic Energy Agency, Vienna 1963. Distributed in U. S. by International Publications, Inc., New York, New York 10016. $13.00; 647 pp.

Among the oldest of topics in reactor physics, the study of heavy-water lattices does not reflect the confidence felt by those working with light-water systems. This second panel report is more than four times the size of the first panel report (published in 1960) and represents a large increase in experimental and theoretical investigations of heavy-water lattices. Were heavy-water design methods as well documented as the light-water methods we should expect a decrease in report size. It is now apparent that in the period 1960-1963 considerable progress was made and future reports will, hopefully, be more specialized if not thinner.

The report is divided into three major sections prefaced by a general summary by the panel chairman, R. Ramanna. The first section, "Status Reports" consists of ten papers which review the depth and scope of various national programs of heavy-water-lattice study. These papers are, of course, largely descriptive and they serve to illustrate the wide variations in lattice designs in use or under study. If there is any conclusion to be drawn from these papers it is that the versatility of D_2O as a moderator is being fully exploited; this is a major source of trouble in arriving at self-consistent widely applicable design methods.

The second section, "Summary of Discussions" is much too brief for so important a subject. All six papers are only one to two pages in length, and each is intended to cover a major topic on the conference agenda: techniques for lattice evaluation, calculations of lattice parameters, summary of computing techniques, neutron spectra, power, temperature and void coefficients, and burnup physics. With only seven months between the conference and publication of the report it would be unreasonable to expect a major review of the discussions, but the summaries here are too brief to do more than report sketchily the background for the panel's recommendations.

As it stands, this report is no substitute for a thorough, analytical review of the technical papers presented. Indeed the third section's title, "Supporting Papers" begs the question: "Supporting what?" is the query—there is no substantial superstructure to be supported. There are twenty-four papers, plus two abstracts, in this section. Of these, the first is a review of recent experience at Chalk River. The next is a review of work performed at the AQUILON facility. With exceptions