larly impressed by the chapter on Special Counting Techniques. Although the description of each technique is necessarily too short to be comprehensive, enough information is given to permit a judgment by the reader as to whether a technique warrants further investigation for his specific problems. One might have hoped, under these circumstances, for a rather more extensive bibliography on these procedures. It is not really possible for an American reviewer to comment intelligently on the more detailed material on equipment since reference is almost exclusively to specific British instruments.

To sum up, the authors have partially succeeded in their aim. The chief value of the book would appear to be as an introduction to radioisotope techniques for the novice in the field, for a general view of the possibilities and requirements. It is to be hoped that he will have more detailed information and training before he tries to apply radioisotope techniques to his work.

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(Editor's Note: Our reviewer, Abraham S. Goldin, has specialized in environmental radionuclide analysis, radioactive pollution, and radioactive wastes. He received his Ph.D. degree from the University of Tennessee. From 1943 to 1950 he worked first for the Manhattan District in Columbia and later for the Gaseous Diffusion Plant at Oak Ridge. Following this, he spent nine years with the U.S. Public Health Service in Cincinnati as chief radiochemist. He was for a time the Chemical Director of the Atomic Energy Commission's Winchester Laboratory and is presently an Associate Professor of Industrial Medicine at New York University.)

Nuclear Reactor Optimization. By P. H. Margen. Simmons-Boardman, New York, 1960. 79 pp., 31 figures. \$1.75.

Mr. Margen is a reactor designer and heat transfer specialist. Educated in England, Margen joined the Swedish Atomic Energy Company in 1955. At present he is head of the Reactor Engineering Department and Deputy Director of the Industrial Reactor Division in that organization.

In his preface the author expresses his aim—that the methods "described in this monograph allow a single designer, supported by a physicist, to achieve the optimization of the main variables in a reasonably short time even without mathematical computers." The book is consequently more valuable for its philosophy than for the direct application of its method. It is doubtful that any project as costly as a power reactor system would not be supported by optimization computations using more refined engineering formulas and more precise mathematical methods. The cost of optimization by machine computations is offset many-fold when even small improvements in the design are effected.

Fourteen independent variables including reactor, lattice, and heat exchanger dimensions, coolant flow and flux flattening, are optimized by the method. The logic is divided into three major blocks, beginning with an initial guess for the design. The reactivity, the heat transfer in the primary coolant loop, and the thermodynamics of the steam plant are optimized in sequence and then the process is iterated. If optimizing is done separately in each block only one or two over-all iterations seem to be necessary. An example is worked out for a 250 MWe reactor with high temperature CO_2 coolant and a D_2O moderator. The fuel assemblies are clusters of UO_2 rods where the number of rods in the cluster and the enrichment are determined by the optimization.

While the treatment lacks refinement of detail it does achieve breadth and generality. Unified into a single calculation are factors too often dealt with independently by the fuel accountants, core designers, heat transfer engineers, and plant economists. In order to do this and yet to preserve the mathematical simplicity he has set as his aim, Margen relies on empirical formulas. This technique is the fundamental point of the monograph. Particularly in the treatment of core data does Margen's approach bear fruit. Any phenomenon can be described in the range of interest by simple and routine operations such as polynomial expansion and tabulation. One can ill-afford to be too fastidious to employ these tools.

I am inclined to take issue with the assertion on page 14 that, because of the lack of sufficiently precise data, "hair-fine optimization of the reactor physics design is not as yet justified." It is indeed true that some areas remain where the lattice data are inadequate, but many other situations exist where precise data have not yet been fully exploited. Furthermore, differential information provided by iterating the optimization can permit the designer to estimate the money that should be spent on an experimental program to obtain these data. Here, by the way, is another reason why the optimization should be performed on a computer: the calculations will have to be repeated many times under varying conditions.

A realistic balance has been achieved in dealing with the components of the design, as based upon their relative effects on the cost of power. Indeed, the flowsheet on page 28 could be used as a skeleton for any optimization process, and the illustration of empirical relations to incorporate the data suggests almost unlimited application in other areas. Every designer of power reactors should be acquainted with this little book.

The monograph is one of a series of paperbacks entitled "Nuclear Engineering Monographs." High standards of technical writing, editing, and printing have been maintained throughout so that the set offers a readable yet succinct survey of the working methods of our English counterparts.

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(Editor's Note: Dr. Brown is in the Theoretical Physics Division of the Savannah River Laboratory. He has recently returned from assignments with the Halden (Norway) Boiling Water Reactor and with the Reactor Division of the International Atomic Energy Agency. At present he is working on a computer code for the optimization of heavy water power reactors.)