about general management decisions involving instrumentation. It seems to me that the specialists have to go to the specialist treatises and the generalists would be far better off working from lists and tabular material of much less imposing dimensions than this volume (and, incidentally, not costing anywhere near $32.50).

One can, in an attempt to moderate this harsh indictment, point out that the handbook does provide leads to manufacturers and also contains a considerable number of references, but this is not what the handbook claims as its objective and, furthermore, judging at least by the references in the section on radioisotope instrumentation, there will be grave dangers in using the referenced articles uncritically. Thus, while it seemed a bit flattering to find one's own neutron-activation method for measuring the thickness of silver plating referenced in this volume, the reference is to work published in 1958, and not even this reviewer would use the method now to measure silver thickness. The world has moved a long way since then.

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The Theory of Branching Processes. By Theodore E. Harris. Springer-Verlag, Berlin; Prentice Hall Inc., Englewood Cliffs, N. J. (1963). 230 pp. $9.00.

A branching process may be thought of as a mathematical representation of the development of a population whose members reproduce and die, independently, subject to laws of chance. In the theory of a branching process we must take into account the *probability* for any possible development of the population and not just the development of an expected value. The development of a neutron population in a zero-power multiplying assembly can evidently be described as a branching process (other examples arise in cosmic-ray showers and biological populations). Although for most neutron multiplication problems one is content to study the expected value of the population which may be, for example, a solution of the time-dependent Boltzmann equation, nevertheless for any consideration of fluctuations and departure from expected values some form of branching theory must be used. The most important mathematical techniques for treating such problems are succinctly described in the present volume.

The first analysis of a branching process was made by Galton and Watson about ninety years ago in considering the extinction of surnames. The theory has seen extensive growth in the last twenty years, and, while many of the results are now standard fare in modern texts on stochastic theory and Markov processes, the Harris book is the most systematic and thorough summary of branching processes now available. The many references to recent Russian work are of particular interest.

The simple Galton-Watson branching process, in which objects of one kind (e.g. sons or neutrons) are considered a generation at a time, is the subject of the first chapter. Principal results are the extinction probability and the asymptotic behavior of the population after a large number of generations. Asymptotic results for subcritical, critical and supercritical populations are described. In succeeding chapters, these basic results are extended to 1) objects with a finite number of types (for example, neutrons and delayed neutron precursors) considered a generation at a time, 2) objects whose type must be characterized by continuous parameters (for example, velocity and position for neutrons), 3) objects considered as a function of continuous time rather than generation number, and 4) objects whose reproductive probabilities depend on their ages after birth.

In a long chapter, application is made to cosmic-ray showers, while a shorter chapter treats neutron multiplication. Emphasis is here placed on an integral equation for the moment-generating functional of the collision density. While much recent work on stochastic theory of neutron populations is not referred to, it can be mostly seen to fit easily into the context of subjects discussed by Dr. Harris.

The level of mathematical sophistication required of the reader will be found moderately high by most reactor physicists. A working knowledge of elementary probability theory (including such subjects as conditional probabilities, generating functions, and forward Kolmogorov equations) is required throughout. Some knowledge of measuretheoretic probability is most helpful in those sections dealing with populations depending on a continuous parameter, but the reviewer can attest that even without such knowledge, while some of the proofs may be obscure, the main results seem quite intelligible. Indeed Dr. Harris often accompanies such results by non-rigorous arguments which would convince most physicists. His presentation is generally quite lucid and, for a mathematical work, relatively informal. Conjecture and speculation about unproved results is even included.

For any serious student of the stochastic theory of neutron multiplication, this book should be of great value.

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Power Reactor Experiments. Proc. Symposium, Vienna, (October 23-27, 1961). International Publications, Inc., New York City. Vol. I, 402 pages, $6.00. Vol. II, 285 pages, $4.00.

The symposium that was held in Vienna in 1961, under the auspices of the International Atomic Energy Agency, included the 32 papers that are published with discussions in this two-volume set. Reviewing the set of papers must be done in the context of the time of the symposium, which was nearly three years ago. All of the reactor systems discussed were developmental in nature, ranging from conceptual design studies to operating experimental reactors such as SRE and the Dounreay fast reactor. If the number of papers presented represented the interests of the industry, it would appear that the greatest activity was in the fields of high temperature gas cooled reactors, fast breeder reactors, and in nuclear superheat.

The collection of papers makes an interesting status report of advanced reactor development in 1961. Unfortunately, as in all collections of this type, the papers vary considerably in the effectiveness of their presentation. In many cases the discussion following the paper proves to be more enlightening than the paper itself.

Among the better papers on developmental reactors are those on Dragon, SRE, Dounreay, BORAX V and the ESADA program. The paper on the Molten Salt program at ORNL is of particular interest because it is the updating of a novel concept with a background of operating experience and discusses the design problems and the engineering details.

The most serious omission was that of the group of papers on Rapsodie, which were not included because of their length. The abstracts that were included are not very informative and the discussion that follows suffers because of the omission of the papers.

This reviewer would like to see experimenters give more details on their experiments and techniques. Under the pressure of space restrictions they tend to dismiss the experimental procedures in a paragraph or two and devote much of the space of the results. Often the results are strongly affected by the experimental method. This is particularly true in studies of fission product releases such as those presented by Brown Boveri/Krupp where a diagram of the loop would have been of considerable interest.

These proceedings are a worthwhile addition to any library collection of reactor engineering information.

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Applications of Neutron Diffraction in Chemistry. By G. E. Bacon. Vol. 1 of Topic 11, "The Ideal Crystalline State," *The International Encyclopedia of Physical Chemistry and Chemical Physics.* Edited by E. A. Guggenheim, J. E. Mayer, and F. C. Tompkins. The Macmillan Company, New York, (1963). 141 pp; $6.50.

This small book contains a valuable review of the contributions which have been made by neutron-diffraction methods to the solution of chemical problems. The author, a principal contributor in the field, writes lucidly and authoritatively.

Chapter 1, "Principles and Methods," provides the absolute minimum discussion of the crystallography, neutron-scattering theory, and experimental techniques needed for appreciation of the